ARMY RESEARCH AND DEVELOPMENT

MONTHLY NEWSMAGAZINE OF THE OFFICE OF THE CHIEF, RESEARCH AND DEVELOPMENT
Vol. 6, No. 5 May 1965 • HEADQUARTERS, DEPARTMENT OF THE ARMY • Washington, D.C.

Army RDT&E Budget for FY 1966 Plan Presented to Congress

Proposed Program Providing for $88 Million Increase Over Current Level Explained by OCRD Budget Officer

Army Research, Development, Test and Evaluation (RDT&E) funding levels for FY 1966, as presented at Congressional committee hearings concluded in early April, provide for a budget of $1,464.3 million, an increase of $88 million over the FY 1965 budget plan.

Secretary of Defense Robert S. McNamara presented the overall DoD budget plan to Congress in February and at that time outlined in detail the specifics of the Army RDT&E proposed budget for FY 1966. He pointed out that the U.S. Army, during the past four years, "has undergone a major renovation and expansion. . . ."

Changes have been so rapid, numerous and extensive, Secretary McNamara said, that it is believed the Army "now needs a period of time in which to digest and consolidate them.

"Accordingly, we do not now propose any additional major changes in the Army force structure, except for a further realignment of the Reserve Components to increase their readiness to augment the Active Army.

"During the past year, we have continued to refine our inventory objectives for specific items of equipment in light of our most recent actual experience and in accordance

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Questionnaires Invite Aid Of Industry in Preparing Reliability Research STAF

Questionnaires addressed to industry early this month seek information on "Research on Materiel Failures" for a Scientific and Technical Applications Forecast (STAF) being prepared by the University of Michigan under an Army contract.

Col Raymond S. Isenson, chief of the Research Plans Office, U.S. Army Research Office, Office of the Chief of Research and Development, explains that "the contractor is now entering a critical phase in obtaining source data from industry for the directory portion of the STAF."

When completed, the STAF will be distributed throughout the Government in accordance with AR 70–31 on Scientific and Technical Reports. Distribution to industry and academic

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13 Personnel Nominated For ERDL CO's Medals

Winners of the annual Commanding Officer's Medals for Scientific Achievement, Technological Achievement, and Leadership at the U.S. Army Engineer R&D Laboratories will be announced late this month.

The date and precise nature of the ceremony at Fort Belvoir, Va., had not been decided at press time. Since the awards were initiated in 1957, recipients have been honored at a banquet, but consideration is being given this year to an outdoor ceremony, to permit more personnel of the Laboratories to participate.

Thirteen engineers, scientists, and supervisors have been nominated—two for the scientific medal, six for the technological achievement award, and five for the leadership medal.

Nominees are selected by the various departments and staff offices at the Laboratories, but the three winners are chosen by the R&D Directorate. Each nominee receives a certificate of achievement and a cash award.

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Featured in This Issue . . .

ARMY LOOKS TO THE FUTURE—Maj Gen Charles Billingslea (right), deputy commanding general of the U.S. Army Combat Developments Command, receives a briefing from Col Glenn Crane, special assistant to the deputy CG for Air Defense Systems, at the U.S. Army Missile Command. As one of the men who decide on equipment and how it is used by the Army, he was briefed on current capabilities and future expectations in missile development.

Army R&D Newsmagazine

Vol. 6, No. 5 May 1965

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Published monthly by the Army Research Office, Office of the Chief of Research and Development, Department of the Army, Washington 25, D.C., in coordination with the Technical and Industrial Liaison Office, OCRD. Grateful acknowledgment is made for the valuable assistance of Technical Liaison Offices within the U.S. Army Materiel Command, the U.S. Army Combat Developments Command, U.S. Continental Army Command, and Office of The Surgeon General. Publication is authorized by AR 310-1, dated Sept. 15, 1964.

Purpose: To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among the widely dispersed and diffused Army R&D activities; to maintain a closer link from top management through all levels to scientists, engineers and technicians at the bench level; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

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Submission of Material: All articles submitted for publication must be channeled through the technical liaison or public information officer at installation or command level.

By-lined Articles: Accuracy and relevancy of contents of this publication to accomplishment of the Army R&D mission are of constant concern to the editors. Primary responsibility for opinions of by-lined authors rests with them; their views do not necessarily reflect the official policy or position of the Department of the Army.

DISTRIBUTION is made automatically each month based on requirements stated on DA Form 12-4, permitting changes as necessary.

Distribution requirements for the Office of the Secretary of the Army, Under Secretary of the Army, Assistant Secretary of the Army (R&D), Chief of Staff, Chief of Research and Development, and Chief of Information will be submitted by the Office of the Chief of Research and Development.

All other Department of the Army agencies should submit their requirements through channels to the Army Publications Distribution Center servicing them.

Changes in requirements of other Government agencies should be submitted directly to the Army Research Office, OCRD, Department of the Army, Washington 25, D.C., ATTN: Scientific and Technical Information Division.

SUBSCRIPTIONS. Public sale of this publication is authorized through the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. Single copies sell for 20 cents. Subscription rates (12 copies annually) are: Domestic (including APO and FPO addresses), $2.25; Foreign, $3.00.

Dr. Hall Stresses Research, Exploratory Development

The foundation of future U.S. military systems rests with the technical area of expenditure supported by the Research and Exploratory Development budget categories.

Dr. Albert C. Hall, Deputy Director (Space), Office of Defense Research and Engineering, stated this view recently at Los Angeles, where he spoke on "The Technological Challenge of the Next 10 years" before an advanced planning briefing for industry.

Discussing a requested $6.5 billion for Congressional appropriation and authorization in FY 1966, he highlighted R&D efforts in four broad functional areas—strategic systems, space, limited warfare, and research and exploratory development.

Dr. Albert C. Hall

Regarding the latter area, he said:

"It is from this area that we seek the ideas that will eventually form the foundation of our future military systems. It is also to this area that we look to avoid technological surprises. I wish we could say where to concentrate your efforts in order to turn up ideas that would lead to developments as significant as the thermonuclear device or the jet engine. Clearly, I can't and it would be a disservice to try. The best we can do is to support sound creative people, set an atmosphere stimulating to meeting defense applications with innovation, and guarantee an audience at any level to the individual with a revolutionary idea.

"Finally let me close by restating how misleading it may be to predict trends in the future by generalizations on the experiences of the past. We emphasize reliability and one way of achieving it is through simplification. This is, of course, desirable, but in electronics we see two developments flowering rapidly that can completely change our concept of what may be feasible in automatic systems. The first of these is the technology of integrated circuits. The second of these developments is the machine assembly of electronic modules into complete systems. . . .

"But as so often is the case, a step forward in one direction uncovers a bottleneck in another. As the complexity of our electronic systems increases, we find that our methods of drecting (or programing) these complex systems are creaking from overload. Programs (software in trade parlance) are so complex that it may require years to discover that subtle errors remain in them. The development of these programs requires such an investment that industry copyrights them.

"We should like to devise methods of proving that a certain computer program actually performs some specified function. Such a method would eliminate costly and time-consuming 'debugging.' In order to be able to prove that a program works correctly, we need both a mathematical theory and automatic checking systems which use the theory. We may be reaching the point where we need to develop a general problem solver able to solve the problem of how to improve itself.

"General problem solvers today are able only to prove simple mathematical theorems, play simple games, and do other trivial work. A general problem solver of the kind mentioned here would reach the 'critical mass' of automatic problem solving, and would open up entirely new technological possibilities. As a matter of fact, if it were good enough, it might even advise us how to spend our RDT&E funds."

Army Chooses ARSTRIKE As New Acronym for STRAC

The dual-corps force which makes up the U.S. Army Forces STRIKE Command, long known by the acronym STRAC, has been officially redesignated more specifically as ARSTRIKE.

The Strategic Army Corps (STRAC) was created in 1958 to provide the Army with the capability for immediate and effective response in an emergency. Originally a light, 3-division force, it now contains two tactical corps, eight combat divisions and other combat and support units.

After the U.S. STRIKE Command came into being in 1961, to broaden the Nation's response capability, its Army element, now ARSTRIKE, took over direction of all STRAC forces.

Pershing Battalion Goes to Europe

The U.S. Army moved the 3rd Battalion, 84th Artillery (Pershing) to Europe in May to provide support to Seventh U.S. Army.

Army RDT&E Budget for FY 1966 Plan Presented to Congress

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with the logistics guidance just described. . . .

"Our proposals also reflect our determined effort to concentrate funds for equipment modernization on those items which will yield the greatest gain in combat effectiveness. As now adjusted, the FY 1965 program totals about $1.9 billion; the proposed FY 1966 program amounts to about $2.0 billion. . . ."

In seeking a further explanation of major Army RDT&E proposals and objectives for FY 1966, the *Army Research and Development Newsmagazine* editorial staff turned to the basic source of that information. The result is the article by Lawrence Cohen, chief, Budget Branch, Programs and Budget Division, Office of Chief of Research and Development.

* * *

By Lawrence Cohen

The Army has submitted to Congress its budget for Research, Development, Test and Evaluation (RDT&E) for fiscal year 1966, totaling $1,464.3 million. As presented, it is requirements oriented and is about $88 million higher than the FY 1965 budget plan. The Army's role in providing general purpose and special purpose forces for use throughout the world calls for an almost infinite variety of potential weapons and equipment.

Based on the Army's broad and varied mission, this multiplicity of requirements results in a diversified R&D effort, consisting of some 460 projects, with over 1,000 subordinate tasks. Efforts vary all the way from developing an antiballistic missile defense for the United States to developing field rations for the frontline soldier.

The budget as submitted can be analyzed in two ways: first, in terms of Budget Activities and second, in terms of Program Categories. The Budget Activities categorize R&D in terms of broad commodity areas.

These categories are used by the Congress in analyzing appropriation requests. They form a framework for formal accounting for R&D funds and are the same for all the military services. Table I compares the 1965 budget plan and the 1966 budget plan now before the Congress.

While funds are appropriated in terms of the Budget Activities shown above, it is difficult to trace the accomplishment of R&D, since various stages of development and research are included in each category.

In managing R&D a somewhat different plan of program categories is used. Formalized in the Department of Defense, these categories represent, in a simplified way, the steps through which ideas are turned into useful military hardware.

Basic knowledge is obtained through research and exploratory development. Our building blocks sector, which includes exploratory development and advanced development, takes new ideas and new knowledge and uses them to develop components and test beds, which are used to upgrade present systems, or become the basis for new systems.

These new systems are carried in engineering development until they are ready for production, when they move into operational systems development. The management and support category provides for such things as facilities and installations support, testing, White Sands Missile Range, and activities not directly related to specific R&D projects.

The following table compares 1965 to 1966 in terms of categories.

As submitted, the budget provides for a continuation of ongoing R&D

(Continued on page 16)

Lawrence Cohen

Lawrence Cohen joined the staff of OCRD in July 1961 as chief of the Budget Branch and is the budget officer for the Armys RDT&E appropriation. Duties involve all phases of budget and financial management of the Army R&D program, ranging from formulation and submission of the annual budget request to Congress to financial operations involved in executing the R&D program.

In 1950 he earned a B.B.A. from College of the City of New York and received his M.B.A. in 1956, also from CCNY. Currently he is attending American University at night as a Ph. D. candidate.

From 1948 to 1952, he was employed as a budget analyst for the First Air Force. In 1952 he moved to the Navy and worked with the Shipbuilding Program until 1955. For the next three years he was with Headquarters, U.S. Air Force as a budget officer and supply officer for textiles, clothing and general supplies. In 1958 he became the budget officer for the Army's major overhaul and maintenance program.

RESEARCH AND DEVELOPMENT (Table I)

BUDGET PROGRAM	FY 1965 BUDGET PLAN	FY 1966 BUDGET PLAN
	(millions of dollars)	
Military Sciences	158.6	169.3
Aircraft	73.0	92.0
Missiles	627.1	640.8
Military Astronautics	15.0	20.4
Ships, Small Craft	.6	1.6
Ordnance, Combat Vehicles	185.3	184.0
Other Equipment	244.2	281.3
Program-Wide Management & Supply	72.5	74.9
TOTAL	1376.4	1464.3

Table 2

	PROGRAM CATEGORIES	FY 1965 BUDGET PLAN	FY 1966 BUDGET PLAN
		(millions of dollars)	
BASIC KNOWLEDGE	Research	91.4	91.8
BUILDING BLOCKS	Exploratory Development	237.7	253.6
	Advanced Development	111.1	125.6
NEW SYSTEMS	Engineering Development	639.8	678.8
	Operational Systems Development	74.9	73.9
	Management and Support	221.4	240.6
	TOTAL	1376.3	1464.3

20 NSF-I Winners to Visit or Work at Army Labs

Army cooperation in the 16th National Science Fair-International (NSF-I) in St. Louis, Mo., May 5-8, involves selection of about 20 winners and 15 alternates for visits to or summer jobs at Army labs.

The Army, Air Force, and Navy each will select one representative to participate in the annual Japan Student Science Awards in Tokyo next November, in line with a Tri-Service support plan initiated in 1963.

As in previous years, Army NSF-I participation is being sponsored by the Chief of Research and Development with the support of the U.S. Army Materiel Command, The Surgeon General, and the Chief of Engineers. The NSF-I is sponsored by Science Service, a prestigious nonprofit organization.

A panel of judge from these Army agencies will select students who will be offered one-week, all-expense-paid visits to Army laboratories. A limited number will have a choice of summer employment that will enable them to work alongside Army research scientists on current projects.

The NSF-I is the culmination of student science fairs involving more than a million boys and girls throughout the U.S. and in foreign lands. Only about 400 survive the keen competition leading to the NSF-I. Fairs this year involved 45 States, the District of Columbia, Canada, Puerto Rico, Japan, Sweden, and, for the first time, Israel.

Maj Gen Austin W. Betts, Deputy Chief of Research and Development, will present Army awards at the NSF-I. Dr. J. Fred Oesterling, Deputy Scientific Director for Research, U.S. Army Natick (Mass.) Laboratories, is chairman of Army judges.

The panel of judges includes: Dr. Harold A. Zahl, director of Research, U.S. Army Electronics Research and Development Laboratories, and Dr. Eduard Gerber, director, Electronics Components Department, U.S. Army Electronics Command, Fort Monmouth, N.J.;

Dr. Robert E. Boyle, Physical Defense Division, and 1st Lt Donald E. McKnight, Entomology Division, U.S. Army Biological Laboratories, Fort Detrick, Md.; Paul Robinson, U.S. Army Chemical Research and Development Laboratories, Edgewood Arsenal, Md.;

Col Hinton J. Baker, special assistant to the director, and Maj Marcel C. Conrad, Department of Hemotology, Division of Medicine, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D. C.; James E. Malcolm, Extraterrestrial Research Agency, Office, Chief of Engineers, Washington, D.C.;

Dr. Z. V. Harvalik, U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.; Dr. Laurence S. Foster, U.S. Army Materials Research Agency, Watertown, Mass.; Edwin Vaughan, Physical Science Administration, Research Office, R&D Directorate, U.S. Army Weapons Command, Rock Island, Ill.;

Capt Daniel A. Bowlus, Research and Development Directorate, U.S. Army Missile Command, Redstone Arsenal, Ala.; 1st Lieutenant Henry B. Tingey, U.S. Army Ballistics Research Laboratories, Aberdeen Proving Ground, Md.

Jack B. Fenn, Scientific and Technical Information Division, U.S. Army Research Office, Office, Chief of Research and Development, will officiate as project officer and recorder for the Army at the NSF-I.

Dr. J. Fred Oesterling

TECOM Reports Outstanding Cost Reduction Results

Value engineering played a major role in exceptional savings achieved by the U.S. Army Test and Evaluation Command (TECOM), Aberdeen, (Md.) Proving Ground, during the first half of Fiscal Year 1965.

A goal of $1,227,000 was set originally for TECOM's share of the Army Cost Reduction Program. By the end of the first quarter, the command had topped this figure by 113 percent, reporting validated savings of $1,388,000. In January, the goals were boosted to $3,764,000 in line with the Command's potential for cutting operating costs.

Review of the program at the end of the second quarter disclosed savings of $4,721,800. Of this amount, economies of $3,841,700 or 102 percent of the revised goal have been validated. TECOM has exceeded the full-year goal again with two more quarters to go.

Value engineering reportedly produced almost half of the $2,070,100 in savings reported by the U.S. Army Electronic Proving Ground (USAEPG), Fort Huachuca, Ariz., one of the installations under TECOM. The USAEPG reportedly has one of the best installation-level cost-reduction programs.

The proving ground cut operating costs $769,900 when it streamlined operations of its Electromagnetic Environmental Test Facility at Gila Bend, Ariz. This was accomplished by eliminating requirements for a huge outdoor laboratory for testing mutual interference of battlefield communications under realistic conditions.

Most of the radio interference testing which was to have been done in the field facility is now conducted with highly reliable results of a mathematical model programed for a computer.

The move to scrap the original plans came after engineers successfully duplicated field test procedures on the model and fed the problem through a computer. The revised procedure makes it possible to conduct a greater number of tests in shorter periods of time and has resulted in substantial economies.

Installation of the new procedures resulted in the elimination of 17 of 24 operating sites scattered over a 2,400-square-mile test area. Requirements for operating personnel dropped from 225 technicians to 130 and the number of transmitters needed to create the desired electromagnetic environment was reduced from 412 to 257.

Fort Huachuca value engineering also effected savings of $148,000 through a design study of radar interference test concepts. Results to date indicate that a more effective design and additional savings will be obtained by providing a radar interference measurement capability for the Gila Bend test facility.

Other top contributors to the TECOM cost-reduction program during the period were White Sands Missile Range, $1,813,000; Aberdeen Proving Ground, $576,800; and Dugway Proving Ground, $181,300.

MICOM Laser Experts Relate Results of Tumor Implants

Results of investigations on internal tumors (cancers) implanted within experimental animals have been described in a technical paper prepared by a surgical investigator assisted by Laser experts from the U.S. Army Missile Command.

Dr. John Peter Minton, a surgical investigator in the Surgery Branch of the National Cancer Institute, National Institute of Health, Bethesda, Md., presented the paper recently at a meeting of the Society of University Surgeons in Philadelphia, Pa.

The experiments have been performed at Redstone Arsenal, Ala., through use of a Laser designed and developed in the Directorate of Research and Development of the Missile Command.

Initial liaison between NIH investigators and Redstone Arsenal engineers was accomplished through the Office of the Surgical Research Branch, Research Division, U.S. Army Medical Research and Development Command.

Importance of the experiments lies in the possibility that:

- Tumor implants of the liver, which are not normally removed in standard surgery when multiple lobes are involved, could be safely destroyed through pulsed Laser energy.
- That pulsed Laser energy may be a safe, effective surgical tool for the rapid and precise destruction of intra-abdominal tumor implants.
- The time required to simply cut the liver over the tumor implant, expose the growth to a pulse of Laser energy and then close the site was notably less than the time required to perform an excision and closure of the liver tissue with standard surgical procedures.
- By utilizing accepted principles of adequate cancer surgery and the precise devitalization of multiple tumor implants by Laser energy, it may be shown by future studies that it is possible to produce prolonged survival of some cancer patients.

Dr. Minton was assisted in his research and in preparation of the paper by Dr. Alfred S. Ketcham, also of the National Cancer Institute, and James R. Dearman and William B. McKnight of the Applied Physics Branch of the Missile Command's Electromagnetic Laboratory.

In earlier experiments announced last year, the same team of researchers had confirmed that certain external malignant tumors in mice could be destroyed by the use of infrared Laser radiation. (See May 1964 *Newsmagazine*, p. 12.)

The continuing research program is conducted under the principles of animal care promulgated by the National Society for Medical Research.

A graduate of Ohio State University, Dr. Minton is a commissioned officer serving in the U.S. Public Health Service. Dr. Ketcham is chief of the Surgery Branch, National Cancer Institute.

The close association between the Army Missile Command and National Cancer Institute dates back to 1963 when the experiments first began. Since that time, between 800 and 1,000 animals have been used in the research program.

Questionnaires Seek Industry Aid for STAF

(Continued from page 1)

institutions will require approval of a request. The contract was awarded by the U.S. Army Research Office in October 1964.

Representative of major areas of prime interest to military R&D organizations, industry, universities and other organizations concerned with mlitary materiel requirements, the STAF will deal with:

1. The state-of-the-art. 2. Forecast of the state-of-the-art for the next 20 years. 3. A research plan suggesting how identified gaps in the state-of-the-art may be filled.

4. A matrix section reflecting the scientific and engineering interdisciplinary relationships and reactions of some 17 life cycle program milestones (of prime interest to managers and engineers) and five major categories of scientific and engineering considerations.

5. An annotated bibliography. 6. A directory of selected organizations and personnel engaged in reliability research activities.

The Research Plans Office initiated the action for the STAF on reliability after reviewing and sampling reliability actvities in research, development, and production areas of Government, industry, and universities over a period of three years.

Early in 1964, an urgent need became evidence for collection of reliability research results in order to identify those being oversupported as well as those which may lack support.

The mechanical reliability area is being particularly emphasized, because reliability activities have had significant attention and support from the military establishments in recent years.

Current administrative efforts to reduce costs and to obtain the optimum return on basic and exploratory research expenditures made the reliability STAF virtually mandatory to increase effectiveness of research planning, Col Isenson pointed out.

The STAF project is being directed by Dr. Charles Lipson of the Mechanical Engineering Department of the University of Michigan. Sumner Meiselman of the Advanced Technology Branch, Research Plans Office, Army Research Office, is serving as the contracting officer's technical representative. Both have special educational and experience qualifications in reliability research. Dr. Lipson is currently a reliability consultant to the National Research Council.

E-Command Consolidates Army Avionics Research

Consolidation of all Army avionics research and development into a new Avionics Laboratory at Fort Monmouth, N.J., follows recent establishment of the Combat Surveillance and Target Acquisition Laboratory in the U.S. Army Electronics Command.

The new laboratory is organized to increased internal scientific and engineering capability so that better monitoring and guidance of avionics R&D can be provided to industrial, institutional and other contractors.

Initial organization calls for six officers and 102 civilian personnel already involved in avionics work in the R&D Laboratories. Acting director of the Avionics Laboratory is Lester M. Lang, formerly technical director of the Avionics and Navigation Aids Commodity Office in ECOM.

Maj Gen Frank W. Moorman, CG of the ECOM, indicated that the strength of the Avionics Laboratory at the end of 1966 will be 20 officers and 250 civilians. To reach the ultimate strength, scientists and engineers will be drawn from industrial and educational communities as well as from Government.

Avionics (acronym for AVIation and electrONICS) is becoming steadily more important to the Army, with increased emphasis on tactical mobility creating greater demands on electronics to assist technical aircraft to execute assigned missions under adverse conditions of weather, enemy action, unprepared terrain, and heavy air traffic.

The special electronic requirements of the Army are such that few electronics systems or items of equipment are available commercially or from the other services. The new laboratory is charged with the mission of developing such systems and equipment for Army aircraft.

The Joint Services Electronics Program (JSEP)

(A Hard Core Research Capability)

By Lt Col R. D. Lambourne

Research in Review...

The Joint Services Electronics Program (JSEP), a mutual enterprise of the Army, Navy, and Air Force, has been organized to provide the Department of Defense with a quick reaction, hard-core research capability.

Effective interchange between the academic community and the military was dramatically demonstrated during World War II at the Massachusetts Institute of Technology Radiation Laboratory, the Columbia Radiation Laboratory, and the Harvard Radio Research Laboratory.

At the close of the war, farsighted individuals within the Government and at various academic institutions anticipated a continuing need for Government sponsorship of basic research in the electronic sciences.

The wartime laboratories, therefore, turned from the study of immediate military problems to basic research under Joint Services sponsorship. Joint Services sponsorship of electronics research has since been extended to six other institutions and a highly sophisticated basic and exploratory research program has also been developed at these universities.

These institutions and the year in which Joint Service support was started are Stanford University (1947), Polytechnic Institute of Brooklyn (1955), University of Illinois (1959), University of California (1961), University of Southern California (1963), and University of Texas (1964).

The JSEP has been implemented by seeking out the most highly qualified graduate electronic research laboratories and supporting them on a level-off-effort basis. General guidelines are given these laboratories. Specific project selection and direction are left to the discretion of the university laboratory directors. When research leads to a demonstration of military significance, the universities are encouraged to seek support of a specific DoD agency or office.

This method of management assures the participating laboratories great program flexibility, permits new ideas to be explored quickly, without the lengthy delays so often encountered in seeking new project support. It also provides a basis of support under which research facilities and instrumentation, which may support a number of projects, can be financed.

The participating University laboratory directors recently have commented on the characteristics of the JSEP which particularly enhance its value to the three Services and to their institutions. A summary of these comments follows:

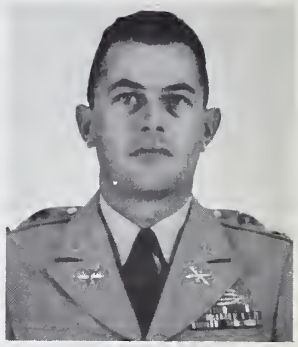
- The first characteristic has been a stable funding level over an extended period of time. It is difficult to overestimate the significance of stable funding in the efficient development of a research program in an academic institution. The faculty, research staff, and graduate student body must be built up by painstaking effort over a period of years. The supporting facilities, including technicians, equipment, and shops, can also be developed with much greater efficiency if planning can be extended over more than a year-to-year basis.

- Another important characteristic of JSEP has been the flexibility of administration based on a research program rather than on a project-by-project basis. Program support places responsibility on the senior faculty member for selection of projects and for use of Federal funds. Experience since World War II has amply demonstrated the ability of the faculties of participating institutions to fulfill this obligation.

- Joint Services sponsorship has acted as a center to which project-oriented research could be readily tied, providing equipment and facilities too general in nature to be properly allocated to a single project. The free interchange of personnel and equipment between the Joint Services Program and related projects has facilitated the progress of the research. The Joint Services sponsorship has been relatively large in comparison with other sponsorship and thus many of the restrictions inherent in small projects have been alleviated.

- A unique characteristic of the JSEP is the continued interest, support, and participation of technically sophisticated representatives of the Services. There is more technical interaction between the Joint Services representatives and the academic community than in most other federally sponsored research programs. It is precisely in this interaction that the program is fulfilling its original purpose of coupling the military and academic communities.

The JSEP is administered by a Technical Advisory Committee (TAC). Consisting of scientific representatives of each of three Services, the TAC currently includes Dr. S. B. Levin, Army member and R. O. Parker, executive secretary, both as-



Lt Col R. D. Lambourne

Lt Col Robert D. Lambourne joined the staff of the U.S. Army Research Office, Physical Sciences Division in July 1963. Assigned to the Physics and Engineering Branch, he has responsibility for the Army Combat Surveillance and Target Acquisition Research Program and is the OCRD monitor for the Joint Services Electronics Program. In 1948 he earned a B.S. degree in mechanical engineering from the University of Utah, then entered the Army as an ROTC Distinguished Military Graduate. In 1955 he received an M.S. degree in electrical engineering from Georgia Institute of Technology. His military experience includes Artillery troop duty in Germany and at Fort Lewis, Wash. from 1949 to 1953. He served as chief, Weather Equipment Maintenance Instruction, USAAMS, Fort Sill, Okla. from 1955 to 1958. Following a tour as an Artillery advisor to the Royal Thai Army, J.M.A.G., Thailand in 1960 he returned to Fort Sill. For his service as chief, Radar Maintenance Instruction and Supervisor, Sensory Equipment Division, Target Acquisition Department, USAAMS, from July 1960 to July 1962 he was awarded the Army Commendation Medal. His military schooling includes the Artillery Officer's Basic and Career Courses, the ADPS Staff Officer's Course, and the Army Command and General Staff College.

signed to the U.S. Army Electronics Laboratories, Fort Monmouth, N.J.; Dr. H. Robl, Army Research Office-Durham, Army deputy member; Dr. A. Shostak, Office of Naval Research, Navy member; Lt Col E. P. Gaines, Office of Scientific Research, Office of Aerospace Research, Air Force member.

Former Army TAC members include Dr. Harold A. Zahl, who was one of the originators of the JSEP concept, and Dr. Edward M. Reilley. Dr. Zahl is Director of Research at the U.S. Army Electronics Laboratories, Fort Monmouth, N.J. Dr. Reilley, former director of the Institute for Exploratory Research at Fort Monmouth, is now Assistant Director of Defense Research and Engineering (Research).

The TAC provides broad technical orientation and guidance for the program; it recommends annual funding levels and proposed budgets for future years, including recommendations concerning addition of new universities to the program.

Financial support on the basis of equal sharing of costs is realized after consideration of TAC recommendations by the three Services. Guidance and support are provided the Army members of TAC by the Physical Sciences Division, U.S. Army Research Office.

Technical review meetings are held at least annually at each of the nine universities. Attendance of scientific personnel from all of the interested offices, agencies, and laboratories within the DoD and other Federal agencies is encouraged. Invitations to these meetings are also extended to the directors of all JSEP laboratories, to assure effective technical liaison.

JSEP RESEARCH PROGRAMS. A brief review of the background, historical highlights, and current activities of the participating universities provide an insight into the scope and nature of the program.

The Research Laboratory of Electronics (RLE) at Massachusetts Institute of Technology, established in 1946, evolved from the Basic Research Group started within the MIT Radiation Laboratory during the latter part of World War II.

The combined talents of the physicists, mathematicians, electrical engineers and others had yielded excellent results in the development of microwave radar during the war years, enabling the RLE to start with a strong heritage of equipment and personnel.

In addition to the original physics and electrical engineering departments, the activities of the RLE involve faculty and students from the departments of mathematics, biology, chemistry, modern languages, geology and geophysics, economics and social sciences, mechanical engineering, and aeronautics and astronautics.

Prof. Henry J. Zimmerman is currently director of RLE. Former directors include Dr. J. A. Stratton, president of MIT, and Dr. J. B. Wiesner, dean of science, who recently served as Presidential Scientific Adviser.

The research conducted at RLE has resulted in more than 425 technical reports, more than 300 doctoral theses, and approximately 900 journal articles.

Current research at RLE consists of atomic and molecular beam studies, microwave spectroscopy, radio astronomy, far-infrared spectroscopy, plasma dynamics including microwave generators and amplifiers, ion propulsion magnetohydodynamics, controlled nuclear fusion, space plasmas, communication sciences including a statistical approach to communications theory, visual information processing, and many contributions to communication engineering.

The stimulus provided by the late Norbert Wiener encouraged the initiation and growth of RLE research related to living systems.

The Joint Service contracts at Harvard are carried out at Cruft Laboratory through the Division of Engineering and Applied Physics. The work is currently directed, through a steering committee headed by Dean Harvey Brooks of the Division, by J. A. Pierce, Prof. R. W. P. King and Prof. N. Bloembergen.

Research efforts in the areas of very low-frequency propagation, electron and solid-state physics, automatic control, communications networks, microwave applications of ferromagnetic and ferroelectric materials, and electromagnetic radiation have resulted in support of the doctoral research of well over 100 graduate students. Some 450 technical reports and numerous articles have been published in technical journals.

Research at Harvard includes studies in nuclear and electron spin resonance under Prof. N. Bloembergen, who proposed the 3-level solid-state Maser in 1956. Other work is being carried out in magnetic resonance, transport properties of semiconductors, studies of tunnel diodes, and theory of spin optical phonon relaxation.

Work is also proceeding in electromagnetic radiation and diffraction, antenna theory and practice, stable oscillators, and long-range propagation studies. In the field of automatic control, work is under way on opitmal control of nonlinear and time-varying systems, optimal programing of nonlinear systems with linear control and linear filtering for time-varying systems.

The initial work of the Columbia Radiation Laboratory (CRL) in World War II was directed toward the successful development of the magnetron at one cm. wavelength, an essential step in extending the operation of radar systems to even shorter wavelengths, under the leadership of I. I. Rabi.

One of the original large efforts at CRL in the field of microwave spectroscopy has yielded valuable information about molecular structure, and about the spins and electrical quadrupole moments of the nuclei of atoms.

New knowledge of molecular energy levels by 1951 led to support of experimental work by Dr. Charles H. Townes on generation of microwave oscillations by stimulated emission from excited molecules, leading to a "Maser" based on the use of a beam of excited ammonia molecules. His success gave birth to the Maser and Laser concepts.

Work was started in 1957 on a pulsed 2-level system utilizing the spins of paramagnetic rare-earth ions in crystals cooled to the temperature of liquid helium. This was followed by a 3-level CW Maser in the 3-cm. range, using a synthetic ruby as an active substance, which served as a highly sensitive, low-noise amplifier for a radio-telescope early in 1958.

In 1964 a Nobel Prize was awarded to Dr. Charles H. Townes for "fundamental work in the field of quantum electronics which has led to the construction of oscillators and amplifiers based on the Maser-Laser principle."

Dr. Townes, presently provost at MIT, accepted an appointment at Columbia University in 1948 and was associated with CRL from that time until 1955, serving as executive director from 1950 to 1952.

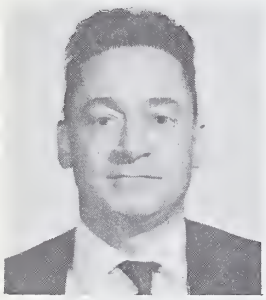
Other Nobel Prizes were awarded in 1955 to CRL's Prof. P. Kusch, for "precision determination of the magnetic movement of the electron, by passing atomic and molecular beams through appropriate magnetic fields" and Prof. W. E. Lamb for "discoveries regarding the hyperfine structure of the hydrogen spectrum using microwave excitations." Prof. Kusch followed Dr. Townes as executive director of the Laboratory and served until 1960, at which time Prof. R. Novick was appointed.

In May 1964, CRL produced a simpler, more compact atomic clock,

(Continued on page 18)

Army Life Sciences Research Program Objectives Explained

COL TYRON E. HUBER, chief, Life Sciences Division since January 1961, served previously as deputy director, Walter Reed Army Institute of Research; chief, Medical Research Branch, R&D Division, Office of The Surgeon General (TSG); chief, Medical Service and deputy CO, U.S. Army Hospital, Yokohama, Japan; Training Division, Office of TSG, European Theater; also served at Brooke Army Hospital and Madigan Army Hospital. Graduated from University of Illinois, St. Louis U. School of Medicine, Army Field Medical Service School, Army Medical Service Graduate School, and the Army Command and General Staff College.



DR. CARL LAMANNA, deputy chief and scientific adviser, Life Sciences Division since 1961, served four years as scientific director and research bacteriologist, Naval Biological Lab; 9 years as associate professor, microbiology, Johns Hopkins U.; received Meritorious Civilian Service Award for work leading to crystallization of toxin of botulism at Fort Detrick, Md., Army laboratories, 1944-48; author of 60 scientific papers and coauthor of textbook Basic Bacteriology. While at Johns Hopkins, was visiting World Health Organization professor of microbiology, University of Philippines.

COL THURMOND D. BOAZ, Jr., chief of the Special Projects Branch since July 1963, served with 9th Army Hospital Center in Germany; as Preventive Medicine Officer on provincial teams of the United Nations Civil Assistance Command in Korea; at Walter Reed Army Institute of Research; and the Medical Field Service School, Fort Sam Houston, Tex. Holds B.S., M.D. degrees from Louisiana State University and M.P.H. from Harvard University School of Public Health.

COL ROBERT B. BENNETT, chief, Medical and Biological Sciences Branch, came to the division in 1963 from a tour with Eighth Army (Korea) as chief, Plans Division, Quartermaster Section. From 1961-62, he served in OCRD as chief, Combat Materiel Branch. Holds B.A., Mount Union College, in social sciences; M.B.A. New York University, in research management; graduate of Command and General Staff College, and ICAF Economics of National Security Course; also, Army Management School. Graduate work in clinical psychology at Ohio State in 140. Member American Association for the Advancement of Science.

DR. C. JELLEFF CARR, chief, Scientific Analysis Branch, since May 1963. B.S., M.S., Ph. D. in pharmacology, University of Maryland. From 1957-63, served with National Institutes of Health (NIH), six years as chief of Pharmacology Unit, National Institute of Mental Health; served as head of Department of Pharmacology, Purdue University, 1955-57 and as professor of pharmacology, University of Maryland School of Medicine, 1933-55. Author of numerous articles and coauthor of textbook on pharmacology; member of many professional organizations.

The prime concern of the Life Sciences Division, Office of the Chief of Research and Development, is the Army's Bio-Medical R&D program to protect the health and welfare of U.S. Army troops under all conditions of peace or war wherever they may exist throughout the world.

The Division plans, supervises, and evaluates the effectiveness of research activities involving the nutrition, clothing, shelter needs, and protection from the dangers of disease for the American soldier on a worldwide basis, including all extremes of environment.

Organized into three branches, the Division is headed by Col Tyron E. Huber, who was deputy director of the Walter Reed Army Institute of Research until he assumed his present duties in December 1960. Dr. Carl A. Lamanna, former scientific director and research bacteriologist at the Naval Biological Research Laboratory, became his deputy and scientific adviser in 1961.

The chief of the Medical and Biological Sciences Branch is Col Robert B. Bennett, Dr. C. Jelleff Carr heads the Scientific Analysis Branch, and Col Thurmond D. Boaz, Jr., directs the Special Projects Branch. All have distinguished themselves in their fields of medical research.

The Life Sciences Division exercises general staff supervision over research, development, test and evaluation (RDT&E) programs of the Army Medical Service (AMEDS) and the research and exploratory development programs of the Army Materiel Command (AMC) in the life sciences.

In addition, the Division functions as technical contact at Army General Staff level for the Assistant Secretary of the Army (R&D), the Director of Defense Research and Engineering (DDR&E), and the Army commands and other staff agencies in matters pertaining to the Army life sciences program.

The Division provides the principal advice and assistance to the Director of Army Research, the Chief and Deputy Chief of Research and Development in respect to the life sciences research and exploratory development programs.

Additional responsibilities include: monitors and supervises the research, development, test and evaluation of medical materiel for the Army; monitors and supervises the Army-wide program in life sciences basic research; and participates in the formu-

lation of plans and programs in assigned areas.

The Division furnishes Army staff representation at meetings of technical bodies such as the DDR&E Joint Medical Research Conference, National Aeronautics and Space Administration-Department of Defense (NASA-DoD) Life Sciences Coordinating Committee, DoD Coordinating Committee on Science, Army Medical Service Materiel Technical Committee, Defense Atomic Support Agency (DASA) Biomedical Panel Weapons Effect Board, Army Forces Pest Control Board and other similar groups.

The Medical and Biological Sciences Branch is responsible for General Staff supervision of the AMEDS RDT&E program and the CB (chemical-biological) medical research program of the Army; General Staff supervision of the life sciences portion of the Army Materiel Command research and exploratory development program; participation in the formulation of plans and programs in assigned areas of R&D.

Some of the specific projects which the Branch monitors are: Individual Combat Protective Clothing and Equipment Research (AMC); Military Medical Materiel (AMEDS); Non-Defense Medical Aspects of Chemical Agents (AMC); Medical Defense Aspects of Biological Agents and Medical Defense Chemical Agents (AMC); Aspects of Field Medical Equipment and Drugs (AMEDS); and Ionizing Radiation Injury, Prevention and Treatment.

Personnel in the Branch agree that one of the most dramatic and exciting tasks currently being monitored by the Branch is MUST. This stands for Medical Unit Self-Contained, Transportable, a revolutionary concept in field medical care, which was recently demonstrated publicly for the first time at Fort Sam Houston, Tex.

MUST consists of three compact basic elements which contain their own initial equipment and supplies—an expandable surgical element, an inflatable ward element, and a utility element which supplies hot and cold running water, heat, air conditioning, and waste removal.

Air locks on the surgical and ward elements provide a greatly improved contamination-free environment inside. The basic elements can be moved by a variety of forms of transportation over land, sea, or air and can be set up and operating in about 30 minutes.

Multiples of the basic elements can be combined to form a field hospital. (For more complete details on MUST, see the March 1965 issue of the *Newsmagazine*, page 1.)

A lightweight anesthesia apparatus for field army or other emergency use is approximately one-half the weight of the old item and has been developed under monitorship of the Branch. A jet injection device for immunizations with intradermal tip can dispense vaccinations at the rate of about 1,400 patients per hour, a capability that has proved valuable in a number of civilian disaster areas, both in the U.S. and abroad.

The Special Projects Branch has primary responsibility for matters related to staff supervision of basic research in the life sciences, and participation in the formulation of plans and programs for basic research. The Branch also acts as a point of contact for members of the civilian scientific community in the life sciences and represents the Division in contacts with other elements of the Army staff and other governmental agencies. It provides representation to the Committee on Toxicology, National Academy of Sciences-National Research Council, and the Armed Forces Pest Control Board.

Some of the specific areas of responsibility include: basic research in support of military medicine (AMEDS) and materiel (AMC); communicable diseases and immunology (AMEDS); military preventive medicine (AMEDS); oral and maxillofacial military health (AMEDS); biological research on protection of materiel (AMC); and applied microbiological research (AMC).

The Scientific Analysis Branch is responsible for critical analyses of research areas of programic interest to the Life Sciences Division. Written scientific reviews are prepared that provide an evaluation of ongoing research programs and contemplated subjects for future research.

The Branch monitors radiation preservation of food and food research (AMC); combat surgery, military internal medicine, and military psychiatry (AMEDS); wound ballistics (AMC); military medical research program in Southeast Asia (AMEDS); military environmental medicine, Army aviation medicine, advisory services and clinical investigations (AMEDS).

Analysis of the scientific content of the Army research program in the life sciences is necessary for the development of a properly balanced research program. As a part of long-range planning activities, the Branch has contributed the life sciences section of the Long-Range Technological Forecast, for the Department of the Army.

Each member of the Branch maintains an interest in his scientific specialty and serves as a liaison member with professional bodies that coincide with Army research needs.

Major interests include the preservation of foods by radiation to provide troops in the field with food that has an increased shelf life and can be prepared readily under field conditions; and the Army medical aviation research program that deals with medical problems of the pilot peculiar to low-flying, fixed-wing aircraft and helicopters.

Research in military internal medicine, combat surgery, and military psychiatry aims, in part, to discover superior drugs for countering drug-resistant falciparum malaria, the rapid treatment of combat wounds, including maxillofacial injuries, and the prevention of behavioral abnormalities under military operations. Staff papers are prepared that evaluate these research interests and guide future activities.

The Life Sciences Division, with its three branches, monitors and coordinates a wide program of projects and tasks being carried out by The Surgeon General's AMEDS R&D Command, the AMC's U.S. Army Natick (Mass.) Laboratories, the Chemical R&D Laboratories at Edgewood (Md.) Arsenal, and the U.S. Army Medical Unit, Fort Detrick, Md.

In addition, the Division has contracted studies worldwide to provide new knowledge in the life sciences for the benefit and protection of the U.S. Army soldier. U.S. responsibilities make it mandatory that the Army be capable of operations in all the disease-prone areas of the world, posing a challenge in the provisions of adequate safeguards for maintaining the health and operational efficiency of the individual soldier.

Research, development, test and evaluation supervised by the Life Sciences Division seek to assure that scientific resources will serve to keep U.S. soldiers physically fit and ready for their global role in a fast-changing world.

Society Elects OTSG Scientist

Dr. Glenn R. Hawkes, psychologist and chief of the Basic Sciences Reserch Branch of the U.S. Army Medical Research and Development Command, Office of The Surgeon General, was recently elected secretary of the Southern Society for Philosophy and Psychology.

The Society has been in existence for over 60 years, with current membership topping 650. Many are scientists at Army laboratories.

Sanders Returns to WRAIR From Far East

Commanding officer of the U.S. Army Research and Development Group-Far East Col Arvey C. Sanders left Japan Apr. 14 for assignment to Walter Reed Army Institute of Research, Washington, D.C.

Col Sanders arrived in Japan in July 1962 to head one of the U.S. Army's three overseas research and development offices under the Chief of Research and Development.

A veteran of 28 years in Army Medical Service Research, he was responsible in his Far East assignment for directing support of basic research in Japanese and Far Eastern universities and nonprofit research institutes. He described work of the U.S. Army R&D Group-Far East as follows:

Support of R&D embraces virtually every well-known university in Japan and in Thailand and the Philippines. In addition, there are applications from several universities in Far Eastern countries under consideration for contracts and grants.

The Army R&D Group-Far East operates in very close cooperation with the science attache at the American Embassy in Tokyo in these activities. Army support by contract or grant is awarded only after rigid evaluation of proposals.

Most of the U.S. Army research sponsored in the Far East is in biological and medical fiields. Only unclassified research, results of which are published and are therefore of importance to civilian as well as military communities, is sponsored.

A significant contribution to the total research program of the Department of the Army has been made by Japanese scientists in the fields of biochemistry, bacteriology, experimental surgery, and human physiology, Col Sanders stated.

Results, for example, have furthered man's knowledge of bacillary dysentery, a long-standing problem to civilians in the Far East.

In the overall Army research program, certain aspects can be better accomplished by Far Eastern scientists than is possible in the U.S. because of the uniqueness of a problem or special qualifications of an individual scientist.

Cholera, for example, is not a significant medical problem in the U.S. but it is always present in Far Eastern countries. Consequently few American scientists have the opportunity to study the disease and its treatment. Far Eastern scientists are especially well trained to carry out cholera research.

The U.S. Army has a requirement, Col Sanders explained, to learn all it can about the diseases indigenous to the areas in which military personnel and their dependents are stationed.

Previously, he served as chief, Department of Bacteriology, Walter Reed Army Institute of Research (1959-62), and chief, Biological and Medical Sciences Branch, U.S. Army Research Office, Office of the Chief of Research and Development (1957-59).

He also spent a tour in Japan (1948-51) as chief, Department of Bacteriology, 406th Medical General Laboratory. From 1946-48, he was at Walter Reed General Hospital. During World War II, he served in England and France.

Col Sanders has a Ph.D. degree in bacteriology from the University of Maryland and has received the U.S. Army Surgeon General's "A" Award in bacteriology for being one of the top scientists in his field.

Col Arvey S. Sanders

Service Tests Slated for 25-man Dehydrated Meals

Production of 75,000 compact, 25-man, uncooked meals will be completed this month for engineer/service testing during a 6-day cycle (18 menus) later this summer.

As one of a system of meals being developed by the U.S. Army Natick (Mass.) Laboratories, the 25-man uncooked meal will replace the standard B Ration currently used for large group feeding where field kitchen equipment is available.

The meal will be supplemented by bread and cakes furnished by field bakeries. A continuous bakery system using an instant (chemically leavened) bread mix is also being developed by the Natick Laboratories to reduce bakery support requirements.

Canned foods which make up the bulk of the B Ration will be replaced by new dehydrated foods and food mixes, reducing both weight and cube. When developed, foods preserved by ionizing radiation will also be incorporated into these meals. Refrigerated storage is not required.

The use of flexible packaging materials will also result in savings in weight and cube of the 25-man uncooked meal. The average weight of the 25-man module is 19.5 pounds as compared to 36 pounds for the B Ration. The cube will be reduced from 1.0 cubic foot to .83 cubic foot.

The utilization of the meal into 25-man modules will reduce ration breakdown and issue requirements from 100 separate items of the B Ration to the single unit modules plus bakery supplement for the 25-man uncooked meal.

Typical menus for the meals are: Breakfast — fruit cup, oatmeal, scrambled eggs, bacon, toast, cocoa, coffee; Dinner—sliced roast pork with gravy, mashed potatoes, lima beans, bread, white cake with strawberry sauce, milk, coffee; Supper—onion soup, breaded steak, spanish rice, corn, bread, chocolate pudding, coffee.

Nagging Women Suggested As Psychological Weapon

A time-honored weapon of womanhood which has been successfully service tested in matrimonial situations since the primeval era has been suggested as a new psychological warfare device for the U.S. Army.

What the suggestor had in mind (his name shall remain anonymous—not for reason of national security, but for his own personal safety at home) is effective use of the not-so-gentle art of nagging on the enemy.

In a proposal to the Research Contracts and Grants Branch, U.S. Army Research Office, he writes: "A nagging woman can drive a man crazy if she keeps it up long enough. If a woman wants something done, she starts to nag and keeps it up until the man moves. No physical force is used, only the tone of voice and the nagging.

"My suggestion is to use this against the enemy by recording a particularly obnoxious nagger in the enemy's language. These recordings could be dropped by parachute behind the enemy lines and suitable messages could be blared out loudly at them."

Perhaps only because of her foreign language shortcomings, the suggestor failed to volunteer his wife as a super-psychological weapon.

DoD Policy Simplifies Markings on Defense Technical Documents

Markings on Department of Defense technical documents to control distribution will be simplified under a broad new policy announced by the Department of Defense.

The policy stated in DoD Directive 5200.20 affects the full range of technical documentation employed by DoD components and their contractors. It provides that DoD contractors shall use a single distribution statement and instructs DoD officers to use one of five other officially authorized distribution statements. Provision also is made for automatic removal of three of these six distribution statements after three years.

Existing regulations relating to markings used for military security purposes remain unchanged. The new markings are intended for use on either classified or unclassified technical documents, where appropriate.

"Distribution Statements (other than security) on Technical Documents" was issued by Cyrus R. Vance, Deputy Secretary of Defense. DoD units responsible for generation or handling of technical documents are given until Jan. 1, 1966 to comply fully with its provisions.

The one distribution statement allowed for use by DoD contractors has been established by recent revisions to the Armed Services Procurement Regulation (ASPR). It provides for those circumstances in which the DoD obtains only limited rights to the data contained in the technical document.

The "limited rights" statement permits the Government to use the data, but disclosure outside the Government is not permitted except in certain specified types of emergency.

The "limited rights" statement may be removed only by the contractor or by formal negotiation with the contractor, and there is no automatic removal of such statements.

In order of increasing controls, the five statements provide for (1) worldwide public dissemination, (2) to U.S. citizens only, (3) within the Government only, (4) within DoD only, and (5) within the originating DoD component only.

The statement restricting distribution to U.S. citizens only is derived primarily from laws relating to export of U.S. military and commercial know-how, and this statement will remain in effect as long as the laws on which it is based continue in force.

The last three statements automatically lose their effect at the end of three years unless the originator takes official steps to continue them for another three years.

The new Directive provides that each use of one of the controlling statements be individually justified, and it summarizes the allowable reasons for using each of the controlling statements. It also provides that all copies of a technical report, or other technical data document, shall be marked with the appropriate distribution statement in a prominent location.

Procedures are set forth for public release of technical documents as they become declassified or as they lose the protection of one of the statements which prevent public dissemination.

Issuance of the Directive is a product of studies undertaken more than a year ago to identify and recommend action on factors which inhibit the flow of technical documents in DoD.

A committee of representatives from the military departments and from Office of the Secretary of Defense units formulated the basic specifications for DoD action to reduce the variety of distribution statements now being used and to increase the care being taken to insure that each use of such statements is fully justified by the content of each technical document.

Fort Huachuca Hosts Micrometeorological Parley

More than 60 representatives of U.S. Army research elements, Federal agencies, and academic institutions attended the recent 3-day 7th annual Micrometeorological Conference at Fort Huachuca, Ariz.

Sponsored by the U.S. Army Electronics Research and Development Activity, Arizona (USAERDAA), an element of the U.S. Army Electronics Command, Fort Monmouth, N.J., the conference emphasized the Army Micrometeorological Basic Research Program.

After opening remarks by Col Harry W. Elkins, USAERDAA commander, a presentation on "Effects of Thermal Winds on the Boundary Layer" was made by Dr. H. H. Lettau, chairman of the Meteorology Department, University of Wisconsin and an internationally known meteorologist.

Progress reports were given by several investigators whose work is supported by Army research grants. Dr. F. A. Brooks of the University of California reported on "Interpretations of Measurements of Flux Rates and Radiation Near the Ground."

Dr. J. E. Cermak, Colorado State University discussed "Flow Over Rough Boundaries." Dr. M. Estoque, University of Hawaii, spoke on "Applications of Numerical Methods to Atmospheric Boundary Layer Problems." Dr. J. A. Businger, University of Washington, presented "Strong Vortex Motion in the Lower Atmosphere and Its Relationship to Turbulence."

Mrs. Frances Whedon, one of the Army's leading meteorologists, assigned to the Environmental Sciences Division, U.S. Army Research Office, and Robert R. Philippe, chief, Environmental Sciences Branch, U.S. Army Materiel Command, were among Department of the Army headquarters staff personnel present.

CHECKING SLIDES before visual portion of Micrometeorological Conference at Fort Huachuca, Ariz., are (l. to r.) Lt Col C. F. Dietrich, Office of the Chief of Communications-Electronics; Maj W. J. Hewitt, Fort Huachuca; Mrs. Frances Whedon, U.S. Army Research Office; Dr. H. H. Lettau, University of Wisconsin; and Col H. W. Elkins, Huachuca.

Dr. J. H. Wakelin, Jr.

Dr. Finn J. Larsen

Arthur E. Raymond

Dr. J. S. Foster, Jr.

RAC Adds Eminent R&D Leaders to Board

Four nationally prominent figures in research and development, including former assistant secretaries of the Army and Navy for R&D, were added recently to the Research Analysis Corp. Board of Trustees.

RAC, a nonprofit research contract agency of the Army and other Government agencies, is headquartered at McLean, Va. RAC employs more than 550 people who utilize operations research and systems engineering methodology to probe complex military and related technical, political, and economic problem areas.

The new trustees are Dr. Finn J. Larsen, corporate vice president of Honeywell Inc. and former assistant secretary of the Army (R&D); Dr. James H. Wakelin, Jr., president of Scientific Engineering Institute of Waltham, Mass., and former assistant secretary of the Navy (R&D);

Dr. John Stuart Foster, Jr., director of the University of California's Lawrence Radiation Laboratory; and Arthur E. Raymond, consultant to NASA and RAND Corp., retired vice president of engineering, Douglas Aircraft Co.

The new trustees join a Board whose members include Frank A. Parker, RAC president; General Omar N. Bradley, chairman of the board, Bulova Watch Co.; Dr. Hendrik W. Bode, vice president of Bell Telephone Laboratories; John F. Floberg, general counsel, Firestone Tire and Rubber Co.; Dr. Richard G. Folsom, president of Rensselaer Polytechnic Institute; and Dr. James E. Rudder, president of Texas A&M College.

DR. LARSEN, 49, serves also as general manager of Honeywell's recently established Systems and Research Division.

Responsible for planning and development of avionics, space and weapons systems, the Division also performs studies of research leading to new technologies and products. Dr. Larsen's current activities and interests include chairmanships of the U.S. Army Scientific Advisory Panel (ASAP) and the Aerospace Industries Association's Aerospace Technical Council.

He is also a board member of a number of industrial and educational organizations, and a member of various technical, honorary and civic societies and associations.

A Norwegian by birth, Dr. Larsen graduated from Mankato (Minn.) State College, later reciving an M.A. degree from Drake University and a Ph. D. from Iowa State University. His association with Honeywell has been continuous since 1948, broken only by 1961-63 service as Assistant Secretary of the Army (R&D).

DR. WAKELIN, 53, in addition to holding the presidency of Scientific Engineering Institute, is chairman of the Technical Advisory Board of Ryan Aeronautical Co. and consultant to Perkin-Elmer Corp.

From 1959 to 1964 he was Assistant Secretary of the Navy for R&D. He continues an active interest in naval and related programs, serving as a member of the Naval Research Advisory Committee and of the Naval Ordnance Test Station's Advisory Board.

Among other current responsibilities, he is an overseer of the Thayer School of Engineering, Dartmouth; member of the visting committee of the Department of Astronomy, Harvard; member of the visiting committee of the Department of Naval Architecture and Marine Engineering, MIT; and trustee of the National Geographic Society.

Dr. Wakelin received bachelor's degrees from both Dartmouth and Cambridge, an M.A. from Cambridge, and was awarded his Ph. D. by Yale.

DR. FOSTER, 42, one of the Nation's key scientists in the design and development of nuclear explosives for peaceful and military purposes, has served as director of the Lawrence Radiation Laboratory, Livermore, Calif., since 1961.

In addition, he is a member of the Air Force Scientific Advisory Board, the Army Scientific Advisory Panel, and serves as panel consultant to the President's Science Advisory Committee.

His honors for scientific and administrative achievement have included the Atomic Energy Commission's Ernest O. Lawrence award "for unique contributions, demanding unusual imagination and technical skill, to the development of atomic weapons."

A graduate of McGill University in Canada, he was awarded his Ph. D. by University of California, Berkeley.

ARTHUR E. RAYMOND, 65, is a noted aviation pioneer who joined Douglas Aircraft Co. in 1927, retiring as senior vice president for engineering. He is presently a consultant to the administrator of NASA, consultant to the President of RAND Corp., and trustee of Aerospace Corp.

Among his honors for aviation achievement have been the Spirit of St. Louis medal (1954) and the Daniel Guggenheim medal (1957). Most recently he was awarded the 1965 Sylvanus Albert Reed Award by the American Institute of Aeronautics and Astronautics "for numerous and distinguished contributions to the aeronautical sciences and development of aircraft during the last 30 years."

An honorary Fellow and past president of the Institute of Aeronautical Sciences, he is also a member of the National Academy of Sciences. He is a graduate of Harvard University and was awarded his M.A. degree by MIT.

SATCOM Station No. 2 Announces Command Change

The first commander of SATCOM Station No. 2 at Camp Robert, Calif., Lt Col Wilfred C. St George, has turned over command to Lt Col Ralph E. Hill, after 3½ years at the satellite communications terminal.

Col St. George, who supervised construction of the station for the original ADVENT program and directed its growth during the Army's support of NASA's SYNCOM project, retired last month after a final visit at which he received a special ADVENT Certification of Appreciation.

SATCOM Agency Commander Brig Gen J. Wilson Johnston presented the certificate, which praised Col St. George for his professional competence "demonstrated by the technical performance of this highly complex assembly of electronics equipment."

The special certificate, reserved for those who have accomplished significant achievements in early satellite communications pioneering, noted the increasing efficiency of automation achieved under Col St. George's command. Advances included computer use for the control of satellite tracking and to record station performance and communications test data.

Cited also for participation in "special demonstrations and tests," Col St. George was in command when SATCOM Station No. 2 helped establish two satellite communications records.

The first occurred in 1963 when the station communicated via SYNCOM II, then located over the Atlantic, with another SATCOM station aboard the *USNS Kingsport* in Lagos, Nigeria, establishing a record for the greatest distance (about 7,700 miles) between two points on the earth's surface via communications satellite.

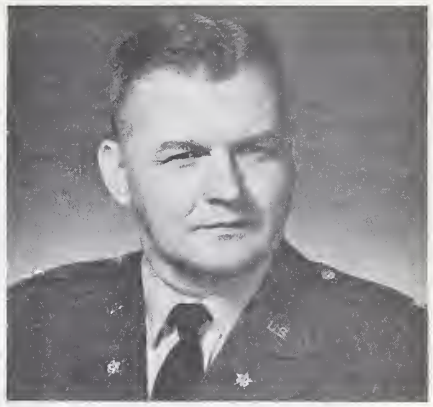
This year the Camp Roberts station served as the U.S. link in a 2-satellite telephone circuit from Fort Monmouth, N.J., to Asmara, Ethiopia, the longest satellite communication communication circuit yet established.

Lt COL HILL, a native of Shamokin, Pa., took command of Station No. 2 after serving as plans and operations officer in the Aviation Division, HQ, USCONARC, Fort Monroe, Va., from January 1962 until 1965.

When Japan attacked Pearl Harbor on December 7, 1941, he was serving in Honolulu as a radio operator. He graduated from the Signal Corps Officers Candidate School after his Hawaiian assignment. Other overseas tours include assignments in Germany and Japan.

Except for the *USNS Kingsport* shipboard station, surface terminals are named by personnel of the U.S. Army's Strategic Communications Command. At the Roberts and Dix fixed stations, however, the commanding officer and chief engineer are organically assigned to the SATCOM Agency.

RETIRING COMMANDER of SATCOM Station No. 2, Lt Col W. C. St. George (left) receives Certificate of Appreciation from Brig Gen J. W. Johnston, SATCOM Agency CG.



Lt Col Ralph E. Hill

HumRRO Investigates Electro-Pulse Communications

Message transmission between a combat leader and his men by means of electro-pulses applied directly to the skin is the type of revolutionary communications system scientists are attempting to develop at the Infantry School.

Called Task COMTAC, the research is being performed at the Fort Benning, Ga., division of the Human Resources Research Office (HumRRO), Alexandria, Va. HumRRO is a U.S. Army contract agency operated by the George Washington University, Washington, D.C.

The task is designed to improve control of a small-unit leader over his men in combat situations which make normal communications impossible or impractical.

Recent research has demonstrated and a subsequent HumRRO exploratory study has confirmed the feasibility of using electro-pulses for communicating information. The communication system presently envisioned by the researchers will utilize separate radio frequency transmitter and receiver units.

Each receiver will be capable of transducing the radio signals into electro-pulses, which would then be relayed to electrodes embedded in a belt or vest-type garment.

The importance of such a system is underlined by the record of communication failures which occurred in Army units during World War II and Korean action due to combat noise, loss of visibility, and other situational factors.

HumRRO is coordinating this project with the U.S. Army Electronics Research and Development Laboratory at Fort Monmouth, N.J., which is taking a hardware-oriented look at tactual communication.

A research team, headed by Dr. Donald L. Brown, has already begun work on Task COMTAC and is now studying the communications requirements existing in typical small-unit operations, with particular emphasis on patrolling and counterinsurgency operations.

This information is being gathered from a survey of military communication doctrine and field monitoring of unit communications in the context of infantry training problems, tests, and exercises.

This phase of the project will result in a cataloging of the kinds of information a useful tactual communication system must be capable of handling.

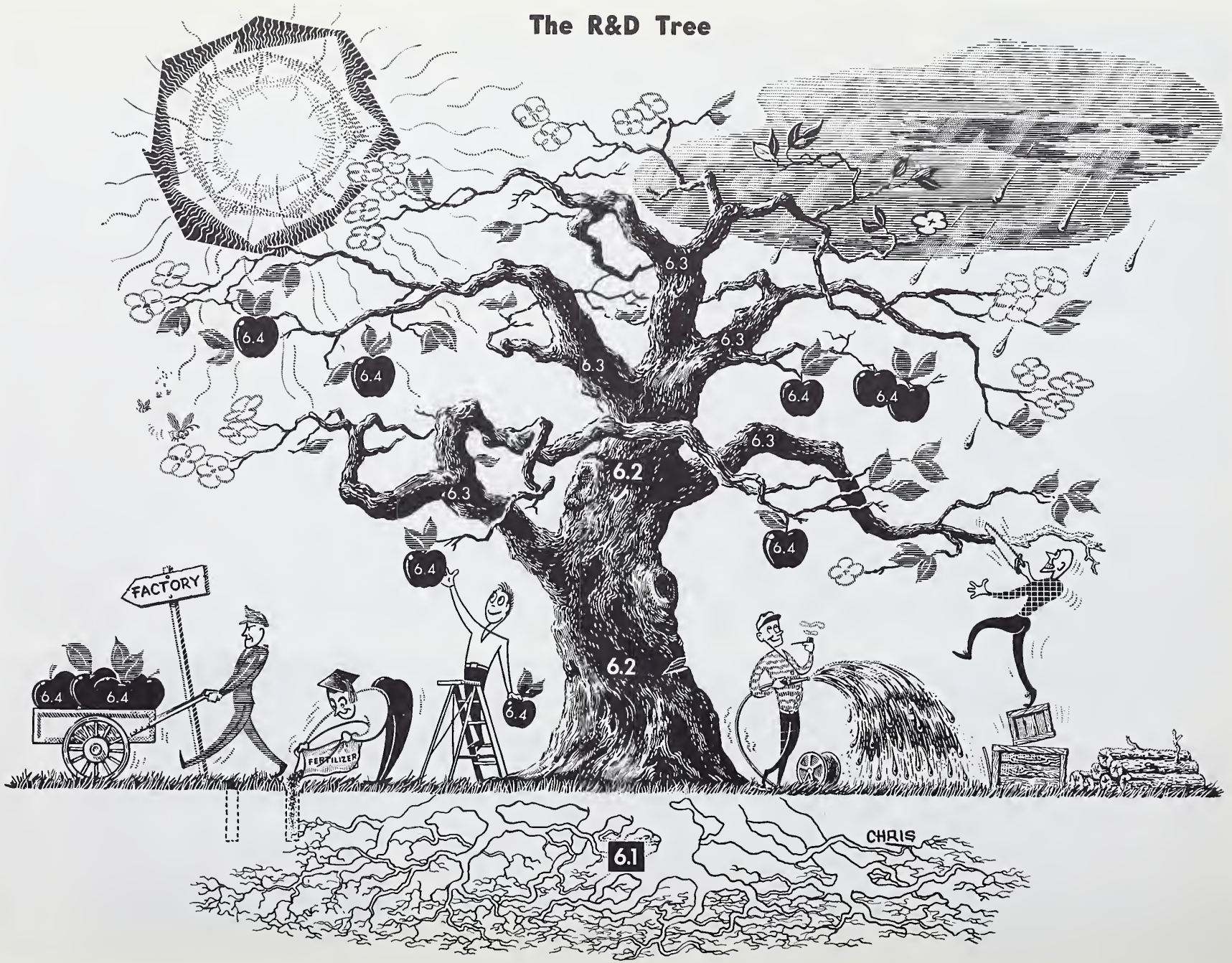
Once this information has been collected, the research team will develop a brief combat language capable of being transmitted tactually and learned easily.

The third phase of the project will be development and evaluation of the most efficient methods for teaching tactual discriminations.

Finally, HumRRO scientists will conduct a series of controlled field tests to determine the new system's ability to help the small-unit leader control his men in such infantry operations as battle drill, fire control, and patrolling.

HumRRO researchers visualize a much wider application of the tactual communication system in military operations other than combat situations.

The R&D Tree



The R&D Tree

By Harold A. Zahl

On the theory that "one picture is worth 1,000 words," the undersigned, working with Mr. S. E. Petrillo, Mr. S. F. Danko, and Dr. H. H. Kedesdy of the U.S. Army Electronics Laboratories, with the invaluable assistance of artist B. H. Christenson, also of USAEL, developed the picture accompanying this article. The various types of R&D effort are shown as a tree with a supporting all-star horticultural cast made up of hypothetical characters.

As I describe this unusual tree, each of my "eligible" readers is invited to cast himself in the role most fitting his personality, talent, and responsibilities in the Defense R&D Drama, a show which has been running before a capacity house for years with no sign of closing—standing room only still remaining the order of the day.

By way of introduction, most everyone knows that one would need astronomical units to add up the amount of good time spent in discussions or arguments involving "complex" questions such as: "Is some particular research basic or applied? Is it applied research or development? Is it a development project or straightforward engineering?"

Over the years, such jousting has been a favorite sport between budgeteers and technical personnel, for often in Department of Defense agencies the very answer determines funding or no-funding for particular projects or activities. Adding more uncertainties, sometimes the true answer can only be found in the mental attitude of the person doing the work, but this point may be lost in the rush.

For example, if a researcher isn't particularly concerned over what happens toward application of any new knowledge he develops, his project might well be called "basic research"; if, however, he sees where it might fit into something useful, or is aimed specifically in a particular direction, it becomes "applied research"—that is, component development.

Arguments, however, generally stop if and when funding starts; the scientist and/or engineer then is always more than willing to call off the semantic warfare.

For some time now, the Department of Defense has been trying to categorize R&D so that most people, at least, would use the same definition, the end result hopefully being that funding of all programs should reflect the same thinking in the distribution of effort and dollars. Four of the major R&D breakdowns now in general use are:

Category 6.1—Basic Research

Category 6.2—Exploratory Development

Category 6.3—Advanced Development

Category 6.4—Engineering Development

Additional DoD categories that will not be discussed in this treatise are 6.5 (Management and Support) and 6.7 (Operational Systems Development).

Let us consider how the first four categories interweave in the fine structure of our hypothetical tree—one tree in the dense DoD forest of research and development. First, look at the roots of a characteristic tree. Long ago, someone planted a seed—an idea. Benevolent sunshine and rain caused some seeds to sprout and the roots of this, shall we say basic research, spread out as new knowledge, came forth from the laboratory. All of these new idea-seeds were initially involved in one of several precarious situations, somewhat as in the Biblical parable:

Behold a sower went forth to sow, and when he sowed some seeds fell by the wayside and the fowls came and devoured them up. Some fell upon stony places where they had not much earth and forthwith they sprung up; because they had no deepness of earth, and when the sun was up, they were scorched, and because they had no roots they withered away. And some fell among thorns and the thorns sprung up and choked them; but others fell into good ground and brought forth fruit, some 100 fold, some 60-fold, some 30-fold—Matthew, 13th Chapter.

As in the parable, a few of our basic research seeds survive (the best ones, we hope) and soon a sprout appears above the ground and people can see it grow. A kind and wise man starts spreading fertilizer, and with soft rain and sunshine, plus additional water during those dry spells we all know about, the little shoot slowly develops a 6.2-type trunk which will gradually become a tree, as long as the environment continues favorable for growth. As shown in the illustration, this 6.2 trunk can eventually support many branches; thus its growth should be encouraged, for it promises fruit in the years ahead.

When the branches appear, certain forward-looking people, 6.3-oriented, see the potential for fruit one day; the blossoms start appearing among the leaves. This is the QMDO (Qualitative Materiel Development Objective) stage. Each blossom means some inventive person now visualizes a specific application from this phenomenon of growth. (See AR 705-5.)

These potential applications, however, come in great abundance. This is a critical period, for as these blossoms appear there must also come good and wise insects for purposes of pollination, so some of the blossoms can gradually grow into a 6.4 product, a fruit for which there is obvious application.

Following this period, however,

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Dr. Harold A. Zahl

Dr. Harold A. Zahl, director of Research at the U.S. Army Electronics Laboratories, Army Electronics Command, Fort Monmouth, N.J., joined the Labs shortly after receiving his Ph. D. in physics (1931) from State University of Iowa.

Dr. Zahl is noted as a scientific pioneer in acoustics, infrared detection and radar, and is among scientists who recognized from the outset the potential of such developments as the Laser, Atomichron (atomic clock), and the use of satellites in communications and meteorology.

He patented a pneumatic cell detector which was a major component in the Army's first radar set, the SCR-268-T1, successfully demonstrated in 1938 . . . contributed many engineering features to early-warning radar sets, including invention of GA-4 transmitter-receiver tube, which made single-antenna systems possible for Army and Air Corps radars.

He entered military service as a major in Signal Corps in 1942, created the VT-108, better known as the Zahl tube, a significant breakthrough in electronics, and was awarded the Legion of Merit before leaving active duty as a lieutenant colonel in mid-1946.

In 1948 he became the first Army scientist promoted under Public Law 313 solely as the result of accomplishments during a Civil Service career. He received the Exceptional Civilian Service Award in 1962 . . . is a member of various professional scientific societies and organizations.

Army RDT&E Budget Plan Presented to Congress

(Continued from page 3)

efforts. While there is a growth in the total R&D dollars between 1965 and 1966, in-house R&D effort will stay at essentially the same level (allowing for some new missions assigned to Army RDT&E, beginning in 1966. These new activities are primarily in support of testing.)

It is anticipated that the number of personnel, both military and civilian, assigned to Army RDT&E activities will remain at the same level, although there may be small adjustments in the number of personnel assigned, particularly at Army Industrial Fund activities.

During the preparation of the 1966 RDT&E budget, a small reduction was made in dollars on the basis that there will be increased productivity in our in-house effort. In addition, a number of proposed increases were not allowed on the basis that we could be more productive, particularly in exploratory development, by being highly selective in choosing areas of investigation.

Table 2 shows that the FY 1966 budget includes $91.8 million for effort in research. This provides for continuation of in-house laboratory independent research, a program which has been reported upon in previous *Army R&D Newsmagazine* articles. While there does not appear to be a growth in the funding for research from 1965 to 1966, there has been a restructuring of effort which makes comparison difficult.

If the 1965 category for research was structured in the same manner as it is in the FY 1966 budget, there would be a modest increase shown in the amount available for research, reflecting the rise in research costs (estimated to be increasing at a rate of about 5 percent a year).

Exploratory development approaches a solution of specific military problems up to the point of developing hardware for operational testing. Along with research, this development provides a pool of knowledge from which future Army weapons systems will be devised and designed.

Comparative figures, rather than the figures shown in Tables 1 and 2, reflect a modest increase in the amount of exploratory development being accomplished. Utilization of these funds, it is expected, will improve greatly by identifying management conditions which have in the past proved highly productive of useful military results and then applying them throughout the Army.

The exploratory development effort provides for studies and analyses, and fabrication, test, and evaluation of various components to establish feasibility, practicability, and relative advantages for use in future major development programs.

Included are components for new infantry close-support artillery and air-defense missiles systems, new and improved suppressive fire systems for Army aircraft, applied research on rocket propellants, work on new power sources and energy transformation devices, new lighter and improved ground surveillance and target acquisition techniques.

Programed also are improved designs and materials for small arms and armor defeating projectiles, nuclear weapons effects as applied to Army equipment, applied research to improve surface mobility, and mapping and geodetic research directed toward overcoming limitations of current equipment and techniques.

Advanced development includes projects which have reached a point where the development of experimental hardware for technical or operational testing is required prior to the determination of which one of alternate approaches should be designed for engineer or eventual service use.

Funds are provided for continuing work on evaluation of V/STOL aircraft, particularly the heavy-lift helicopter and the research helicopter. The largest item in the aircraft program is the XV-6A aircraft, the P1127 Hawker-Siddley, a British-designed lightweight V/STOL Strike Reconnaissance aircraft. This is a Tri-Government, Tri-Service effort but procurement for service use is not contemplated.

Aircraft suppressive fire systems work will continue in FY 1966, as will work on a Command and Control Information System for the field army. Considerable progress has already been made in two areas, intelligence and fire support. The $13.0 million requested for FY 1966 will support work in three other areas, as well as develop efficient automatic data processing and communication equipment.

Work also will continue in communications development, in the chemical-biological field, night vision, and automatic data processing systems. Funds are included for work on an advanced surface-to-air missile system which could replace Hawk and Hercules in the 1970s. It would provide capabilities against high-speed aircraft and short-range missiles.

Because of the complexity of the entire air defense problem, Army R&D efforts during 1966 will concentrate on technological investigations and systems definitions studies.

Engineering development includes projects being engineered for service use which have not as yet been approved for production and procurement. The Nike X program is the largest item in this category. Work will continue to develop this system, including the multifunction array radar (MAR), the missile site radar, high-speed data-processing equipment, the Zeus missile, and high-acceleration Sprint missile. The Nike Zeus testing program will be completed during FY 1965 and all testing will be taken over by the Nike X program.

Funds budgeted for Forward Area Air Defense will be devoted to further analysis of the problem which has been created by the results of the Mauler development program. Another major effort in this program is Lance, the lightweight missile system designed to increase mobility, range, and accuracy of the fire support for combat divisions.

The self-propelled launcher and associated equipment of the Lance system will be capable of sustained ground operations, possess water-crossing capability and be air-droppable. Funds have been included to provide for substantial completion of the system development by FY 1966.

Aircraft suppressive fire systems, and the Advanced Aerial Fire Support Systems (AAFSS) are closely related. The former is concerned with the development and adaptation of weapons subsystems for aircraft, while the latter project would initiate the development of a completely integrated armed helicopter-like system as a replacement for the present armed UH-1B system.

The objective is to develop a stable, manned aerial weapons platform utilizing both integrated and externally mounted weapons subsystems to provide escort of troop carrying helicopter formations and discrete suppressive fires.

Additional effort is required on aircraft engines in FY 1966 and new engine development is planned for 1966 and beyond. The purpose of the program is to develop gas-turbine engines for rotary-wing aircraft with significant improvements over existing engines, especially power-to-weight ratio, lower fuel consumption, higher reliability, and ease of maintenance.

The installation of gas-turbine engines in all aircraft will result in the

use of only one type of aircraft engine fuel, thus simplifying logistic support. Preliminary efforts in this program will be directed to the power plant for the Advanced Aerial Fire Support System.

Funds have been requested for the tactical transport aircraft, CV-7A BUFFALO, being developed jointly by the United States and Canada.

Combat surveillance and target acquisition funds will provide for a number of different projects, such as ground radar for detection of moving vehicles and personnel, sound and flash-ranging equipment for locating hostile weapons, image interpretation and photo processing equipment, and unmanned aerial surveillance system.

Communications and electronics effort is aimed at development of tactical radios, automatic electronic switchboards, and air traffic control systems.

The support planned for infantry individual and supporting weapons effort will be used to translate into hardware those items found during supporting research to offer the most potential for development. Included will be guerrilla and counter-guerrilla weapons, ammunition, explosive and sabotage devices, and a vehicle rapid-fire weapon system.

As for tanks, advances in the state-of-the-art allow for a tank capable of sustained land combat under the full range of battlefield environments, with significantly improved firepower protection and mobility.

To obtain an improved tank for our troops in the most economical manner, an agreement with the Federal Republic of Germany was signed in August 1963. It provides for the cost of the development program to be equally shared between the two countries.

The new tank will have improved firepower with greater range and its armored protection will be much superior. FY 1966 funds will provide for the U.S. share of the tank component costs covered by the joint agreement.

The FY 1966 budget request for the Heavy Antitank Missile TOW would substantially complete the funding of this development.

Many other projects are included in this category, aimed at improving communications and the support of the individual soldier.

In the management and support FY 1966 budget plan are the costs of the operation of White Sands Missile Range, Kwajalein Test Site, and the Army Electronic Proving Ground; also, most of the testing which is not directly accomplished by the developing agency, the Army's share of the electronic compatibility analysis center, a small amount for international cooperative R&D, and the facilities and installation support program for RDT&E at other than non-Army Industrial Fund activities.

The major growth of this activity can be attributed to the transfer of certain missions from the operations and maintenance appropriations and from the Navy and Air Force.

White Sands Missile Range, one of the national ranges used by all Government agencies, will continue to conduct programs of such items as Redeye, Nike X, Lance, Pershing and mass reentry systems, as well as certain safety devices for the NASA Apollo program.

Work will be conducted on the development of improved cameras, telescopes, and other optical and electronic range instrumentation equipment for use at all national ranges.

The Kwajalein Test Site, which the Army assumed from the Navy on July 1, 1964, will continue predominantly to support Nike X.

The range support will consist of normal base activities, communications, range instrumentation, meteorology, data gathering and reduction, and administrative functions. Personnel employed at the test site consist almost entirely of scientific and technical personnel associated with the high priority of Nike X.

Operational systems development, the remaining category, is in effect a memorandum entry in the R&D program. Items in this category have been released for production and procurement and, in the Department of Defense programing system, carried in programs other than RDT&E. However, the funds being applied to these systems as reflected in this category are RDT&E funds.

In this category, the Army is completing engineering service tests of Redeye, and also the development of training devices. Redeye is a single man-carried and operated guided missile system which provides small-unit defense against low-flying aircraft in the forward or isolated battle areas.

Except for support of the engineering and service tests in completion of the training development, R&D activities are completed for the Redeye and procurement may commence without delay.

Other major efforts in missiles in operational systems include Pershing, Sergeant, and Hawk. The incorporation of the Shillelagh missile as the main armament for the General Sheridan vehicle is nearing completion. Also included is work on an interim forward area air defense system.

As is readily apparent, the FY 1966 RDT&E budget covers a multitude of projects and efforts. This budget is at the moment being reviewed by the Congress for both authorization and appropriation of funds. As presented to the Congress it reflected a well-balanced, carefully planned program.

Past experience has shown that there will be some reductions in this program. From the actions taken to date by the various committees of Congress, a cut ranging from $8.0 million to $126.0 million can be anticipated. The final amount will not be known until committees have completed work and presented recommendations to the Congress as a whole.

Until the Appropriation Act has passed both Houses of Congress and has been sent to the President for signature, the Army's final FY 1966 R&D budget is open to conjecture.

ERDL Tests Generator For Much Higher Power

One of the first superconducting generators producing alternating current at a significant power level is being tested by the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.

Capable of producing 8000 watts of alternating electric power, the experimental generator is designed to demonstrate the practicality of using superconductors to generate electricity. It is expected to lead to lightweight, compact, highly mobile power units for a variety of military needs, including military transport vehicles, radar, communications, and advanced weapon systems.

Superconductors are materials that lose all electrical resistance when cooled to near absolute zero (—425° F.). Once started, a current will circulate indefinitely without additional energy as long as the low temperature is maintained.

Instead of the conventional electromagnet, the new model uses a superconducting coil which makes possible a substantial saving in weight and volume. A one-million-watt superconducting generator, for example, including its refrigeration unit, would be about one-third the weight of a conventional electric generator with similar output.

Armory Names Project Director

The U.S. Army Weapons Command's Springfield (Mass.) Armory named David A. Poole as project director for the Remote Area Mobility Study Program (RAMS) in the Engineering Division. His nine years of Armory service includes assignments in the Development Branch, Mechanical Research Branch and the New Concepts area.

Research In Review...

(Continued from page 7)

bringing to fruition the work of many investigators during the prior 10 years. Atomic clocks provide more exact standards for measuring time and distance than do the rate of the earth's rotation and other astronomical phenomena.

In that same year, Prof. Hartman demonstrated for the first time "photon echoes," a new optical phenomenon in which pulses of light may be controlled in their delay by a complex quantum process.

The JSEP supports the Stanford Electronics Laboratories (SEL) and the Microwave Laboratory of the Hansen Laboratory of Physics at Leland Stanford University. Vice President Dr. F. E. Terman originally directed the program, assisted by, among others, Dr. J. M. Pettit, now dean of the School of Engineering. Prof. W. F. Rambo is the SEL director and Prof. Marvin Chodorow heads the Microwave Physics Laboratory.

During the Korean War, these laboratories supported specific defense programs centered about electronic countermeasures. One example was the development of a rapid-scan intercept receiver, using as its major component a dispersive traveling wave tube, the forerunner of a series of such components, and even countermeasure systems, which today are integral portions of DoD programs.

The low-noise traveling wave tube has had even greater impact. Recently the Stanford contributions to certain aspects of Maser and Laser research and also to the design of parametric amplifiers have been of significant importance. The theoretical analysis of the gain, bandwidth, and noise figure of parametric amplifiers by Heffner and Wade is a classic in the field.

Research in networks and information theory represents a small but important fraction of the program at Stanford. One of the more recent developments is the invention by B. Widrow of the memistor and its application to trainable machine (adaptive systems).

Solid-state electronics is another major contributor to the Stanford research program. Early emphasis was almost entirely on circuits; today there is major emphasis on device research and on developing understanding of the fundamental processes involved in solid-state devices.

The radio-propagation program is also an important part of the work at Stanford. Basic studies of radio reflections from meteor trails have stimulated applications in meteor-burst communications, a technique that has interested antijamming possibilities and that is especially useful in arctic areas where normal high-frequency communication is subject to polar blackouts.

Basic information on the interaction of meteors and the upper atmosphere has had important application in problems arising in connection with the re-entry of satellite and guided missiles into the atmosphere.

The Microwave Research Institute (MRI) at Polytechnic Institute of Brooklyn (PIB) arose as an outgrowth of research activities of the Electrical Engineering Department during World War II. Under the initial guidance of Dr. Ernst Weber, PIB president, and later Dr. Nathan Marcuvitz, is gradually evolved as an interdisciplinary research group.

Following a tour as assistant director of Defense Research and Engineering (Research), Dr. Marcuvitz returned to PIB at the close of 1964. Dr. Frederick B. Llewellyn now supervises the activities as director of research with the help of a senior steering committee composed of department chairmen.

When the JSEP program was initiated with MRI, the Institute Research Program was well established in the five areas of electromagnetics, microwave networks and techniques, information processes, feedback and control, and nonlinear circuits.

The effort in electromagnetics was concerned particularly with theoretical boundary value problems involving guided waves in closed structures. Through the years this research became more and more concerned with open guided structures, radiation problems, and propagation in inhomogenous, anisotropic and active and/or time varying media.

In the field of microwave networks and techniques, the early work was motivated by the problems of broad banding and the need for extensions of microwave techniques toward the millimeter wave portion of the spectrum.

More recent problems associated with high-power radars and plasmas have stimulated this group to undertake studies of microwave plasma diagnostics. Work on Lasers has yielded new results in modes in Fabry-Perot interferometers and a novel form of internal reflecting Laser activity.

Research in information processes emphasizes such topics as the theory of broad banding, studies of nonreciprocal networks, particularly in distributed structures, and problems of rapid error-free transmission of information. The research in feedback control originally emphasized electronic amplifier circuits and RC active networks.

Motivated by defense needs for complex guidance systems, control research has been directed toward the analysis and design of adaptive control systems, with the major interest centered on optimal central theory and the probabilistic version of that theory.

Another significant contribution of Brooklyn Polytechnic under the JSEP has been a series of international symposia on electronics research topics. Since 1952 these have consistently presented material in newly development aspects of electronic science.

The subject of the first symposium in 1952 was Modern Network Synthesis, the 1964 symposium theme was Quasi-Optics, and in 1965 Systems Theory. The proceedings of these symposia have been widely disseminated.

The Coordinated Science Laboratory (CSL) at the University of Illinois had its origin in the Control Systems Laboratory organized in 1951. A program was formulated to exploit the technological potential in the new areas of automatic computers and information theory which, when combined with recent radar developments, could be expected to prove revolutionary in their impact on the military problems of battlefield surveillance and command and control.

In the next eight years, the Control Systems Laboratory originated and then demonstrated the technical feasibility of coherent doppler radar, showing its capability for obtaining very high-resolution mapping; the Cornfield System, consisting of a radar-based, computer-controlled, air traffic surveillance and control system which had a major impact on the design of the Naval Tactical Data System; and an airborne, noncoherent doppler radar by which radar acquisition and tracking of moving surface vehicles could be obtained for the purpose of directing armament.

CSL was organized in 1959 and Prof. Daniel Alpert, recently selected to be dean of the Graduate College, University of Illinois, continued as technical director. Associate directors were Prof. C. W. Sherwin (physics) and Prof. M. E. Van Valkenburg (electrical engineering). Dr. Sherwin is presently Deputy Director of Defense Research and Engineering (Research and Technology) in the DoD.

A significant accomplishment at CSL has been demonstration of the feasibility and outstanding performance of a completely new concept in gyroscope design, the Nordsieck electric vacuum gyroscope.

Importance of this concept lies in the potential application of the electric vacuum support principle to problems in navigation and control and also new experiments in basic sciences. (A recently undertaken research program will study the feasibility of carrying out a new satellite-borne experiment to test the general theory of relativity.)

Creative work in surface and vacuum physics has established CSL as a widely recognized center for surface and low-pressure research. Contributions of major consequence in this area include a new explanation for the phenomena of electrical breakdown in vacuum, experimental measurement, and theoretical interpretation of the Auger ejection of electrons from metal surfaces by impinging positive ions; and two new methods for measuring pressures to at least as low as 10^{-12} Torr.

The PLATO (Programed Logic for Automatic Operations) project has made major strides in development of automatic teaching systems which utilize the high-speed digital computer as a central executive control.

Starting with the concept of an automatic tutorial system, capable of serving hundreds of students independently and simultaneously, recent PLATO developments include the demonstration of an inquiry mode in which the teaching logic may be changed to allow the student to ask questions and otherwise vary his dialogue with the machine.

Other accomplishments include contributions in the important field of diagnosis and self repair of sequential switching machines such as digital computers, a new procedure for the design of networks for the broadband matching of an arbitrary load to a source of energy, progress in the study of incoherent scattering of microwaves from plasmas, and advances in the preparation of high magnetic field superconductors, particularly niobium tin.

The Electronics Research Laboratory (ERL) at the University of California was established in 1952. Original research efforts were in the areas of microwave antennas and scattering, high-power microwave tubes, electronic computers, and a small effort in electronic control systems.

In 1961-62 there was considerable expansion under the stimulus of JSEP support which permitted ERL, with Prof. S. S. Silver as director, to accelerate graduate research activity in new or growing areas of semiconductor integrated circuits, high-temperature plasmas, and systems theory. Prof. D. J. Anjelokos is serving this year as acting director.

During the existence of the ERL many research accomplishments have been particularly significant. These include results concerning low-noise traveling wave tubes and very recent work in noise reduction in crossed field tubes. V. H. Rumsey's frequency independent antenna research results have been recognized as the most significant contribution in the antenna field in the past decade.

Investigators at ERL have received recognition for contributions to magnetic recording techniques for electronic computers, semiconductor electronic computers, semiconductor integrated circuit theory, research in high-temperature plasmas and particularly outstanding work in system and control theory.

The Electronics Sciences Laboratories (ESL) at the University of Southern California, with Prof. J. P. Marsh as technical coordinator, conducts solid-state research consisting of fundamental investigations in the electrical, optical, and magnetic properties of matter; applied electromagnetics and plasma research, including investigations in the wave propagation of surface waves, antenna theory, incoherent wave theory, methods of plasma diagnostics, and interaction of plasmas with electromagnetic fields.

Information science research at ESL includes automatic control using adaptive control systems, biological systems, feedback systems with a human operator in the loop, research in automatic computer synthesis of optimum systems, simulation of communication systems, and development of mathematical models of blood circulation dynamics.

The Laboratories for Electronics and Related Science Research at the University of Texas are the most recent addition to the JSEP. Prof. A. A. Douglas is director of the Laboratories. The University of Texas electronics program is strong in network theory, logic function and coding theory, electronic materials, nonlinear electric circuits, physical quantum and plasma electronics, electromagnetics, information processing, biomedical electronics and space, atmospheric, and earth radio sciences.

CONCLUSION: The JSEP has been a model of Tri-Service cooperation. The success of the program reflects the *mutual respect* which the Government members of the Technical Advisory Committe and the university laboratory directors hold for one another. The *longevity* which exists permits growth and new orientation of the technical program as faculty interest, trends in science, and institutional capabilities advance and change. The essential *scientific contact* between all branches of the military and the academic community is maintained in a time of cold war when scientific and technological advances are of such critical military importance. One of the major advantages derives from a *relatively large contract or grant*, as distinguished from a multiplicity of small arrangements.

The three Services continue to look with pride to the accomplishments of the Joint Service Program. Included are the scientific breakthroughs for which Nobel prizes and other recognitions have been given, the steady advances on the technological front which have contributed so much to national security and U.S. industrial leadership, and the thousands of technical reports, graduate theses, and journal articles which are a measure of the continuous and useful exchange of information and data.

Recognized also are the dedication and work of the individuals, both representatives of the Government and members of the academic community, who have contributed so much to this program. Many who started out as administrators or research investigators in the early days of this joint effort have achieved high professional stature and recognition and have made correspondingly high contributions to their institutions and to the Federal service.

It is expected that the Joint Services Electronics Program will continue to be in the forefront of scientific endeavor and will be responsive to specific military problems.

Deputy CG of JTF-8 Retires

Retirement ceremonies for Brig Gen Charles F. Mudgett, Jr., deputy commander, Joint Task Force Eight, under the Defense Atomic Support Agency, included presentation of the Distinguished Service Medal. Lt Gen James Richardson, U.S. Army Deputy Chief of Staff for Personnel.

General Mudgett entered active duty in 1940 and served in North Africa and Italy during World War II; with the Continental Army Command, 1959-61; and as chief of staff, Headquarters Allied Land Forces Southeastern Europe, a NATO command, 1961-63. A graduate of the Army War College and Command and General Staff College, he holds the Legion of Merit, Silver Star and Bronze Star with three Oak Leaf Clusters and Valor Device.

The R&D Tree

(Continued from page 15)

there are also wise, benevolent, and sometimes unpopular horticulturists who selectively thin some blossoms, or early fruit growth, knowing certain branches could not support fruit from every blossom. Only the select fruit for the demanding customer is desired. This is the 6.4 and QMR (Qualitative Materiel Requirement—an Army requirement term) stage. Putting it another way, a decision has been made as to "how much fruit should develop on any particular branch." (See AR 705-5.)

With harvest time, the now surviving products, ripe and ready for use, are picked and "sent to the factory." There full use is made of their nutritious content. The PEMA (Procurement Equipment and Missiles, Army) Program and the entire tree, plus its entourge of helpers, smile since such steps are part of its purpose and destiny.

But alas, there are also occasionally those who would pick the fruit too soon and the product becomes worthless. There are a few too, who let the fruit ripen too much and it spoils before being used; technically speaking, obsolescence sets in before use.

There is also the food woodcutter. He is a steady visitor to our woods. Once a year, usually in the winter—budget time—this expert must look at the tree. The fruit requiring more than a year to mature is examined both for need of nutrition and normal growth. There are dead branches which should be pruned.

There are also some live branches growing in a way so as to suggest later interference with more promising branches. These, the understanding woodcutter cuts down and stacks neatly so all can see this by-product, hopefully making sense, since such wood represents dollars which can be used for the preservation of the forest program, or to plant new seeds.

As the picture shows, a good sense of balance is a necessity in this operation—and this is not an easy job.

This arborical drama goes on and on. Each single performance runs for 12 months; albeit, and understandingly, some fruits take years to ripen into a stage of usefulness. No one part of the tree, or shall we say none of the several acts of this play, are complete to themselves—this is a growth system involving contributions from many.

All characters in this drama, however, should know the entire script (not only their part), for only through the interrelationship of all aspects of this process can the system produce the fruit which is the finale, and the reason for everything in the first place.

Brig Gen Persons Assigned to Air Defense Command

Brig Gen Howard P. Persons, Jr., the U.S. Army Missile Command's Deputy CG for Air Defense Systems, will take a new job at Headquarters, Air Defense Command this month.

Assigned to Redstone Arsenal, Ala., since August 1962, he will be the new Assistant Chief of Staff for Operations, Training, Plans and Combat Development at Ent Air Force Base, Colorado Springs, Colo.

In his current assignment, he is responsible for development and management of missile systems for defense against the threat of aerial attack. In this category are the man-portable Redeye, the Nike Hercules, and the Hawk, deployed in critical areas in the U.S. and overseas.

General Persons has also directed management of various target missile systems, development of multisystem test equipment, establishment of the Air Defense Fire Distribution Systems Office, and work on such advanced systems as Mauler and SAM-D.

He assumed the duties of commanding general at various times during his assignment with the Missile Command, especially during the illness and immediately following the death of Maj Gen Francis J. McMorrow in August 1963.

A native of Monticello, Ga., and a graduate of the U.S. Military Academy in 1936, the 51-year-old general is a combat artilleryman and a qualified parachutist. He commanded the 32nd Artillery Brigade (Air Defense) in Germany immediately prior to his present tour of duty at Redstone.

Other overseas duty with the Seventh Army from 1959 to 1962 includes assistant chief of Staff for Intelligence, Seventh Army; deputy chief of Staff, Seventh Army, and commanding general, 3rd Infantry Division Artillery, Germany.

His World War II service includes participation in campaigns in England, North Africa, Sicily, Italy, and France with the Artillery. Other overseas tours have included service in Korea in 1954-55 with the Eighth Army as executive officer, Second Infantry Divison Artillery; executive officer IX Corps (Group Artillery) and as adviser to the chief of Artillery, Republic of Korea Army.

The general is a graduate of the Air War College, Maxwell Air Force Base, Ala., and Armed Forces Staff College, Norfolk, Va.; and the Command and General Staff College, Fort Leavenworth, Kans., where he also served a 4-year tour as an instructor.

His awards and decorations include the Legion of Merit, Army Commendation Medal, the French Croix de Guerre Order of the Brigade and Order of the Corps, and the Republic of Korea Distinguished Service Medal.

Brig Gen H. P. Persons, Jr.

Retired Navy Captain Fills Defense Procurement Post

Duties of the Deputy Assistant Secretary of Defense (Procurement) were turned over to John H. Malloy, a retired Navy captain and executive of North American Aviation, Inc., early in April.

Graeme C. Bannerman vacated that office when he became Assistant Secretary of the Navy (Installations and Logistics). Malloy was responsible for assisting in the development of company contracting policies and their implementation.

Retired from the U.S. Navy on July 1, 1963, after 22 years of service, he holds an A.B. degree (1940) from Boston College and a master's degree in business administration (1947) from the Harvard Graduate School. He was a 1958 graduate of the Industrial College of the Armed Forces.

During his service in the Navy, he served in a variety of assignments in the procurement field, including head of the Navy Purchasing Office, Washington, D.C.; head of the Navy Purchasing Office at Los Angeles; and chairman of the Armed Services Procurement Regulation Committee in the Office of the Assistant Secretary of Defense (Installations and Logistics).

STRATCOM Buys 'World's Fastest Teletypewriter'

A high-speed electronic data printer with operating speeds up to 400 words per minute will be introduced this summer into the Army's strategic communications network in the United States, Pacific, Europe, Latin America, and Southeast Asia.

Described as the world's fastest teletypewriter capable of producing page copy, the new AN/FGC–80 printers are being procured for use by the U.S. Army Strategic Communications Command with stations and facilities in more than 30 countries.

Maj Gen Richard J. Meyer, CG of the Strategic Communications Command (STRATCOM), said that about 245 of the send-receive units were selected and adapted for military use to help the Army cope with changing demands for faster and more responsive communcations.

When operating at its full high speed capability of some 40 characters or letters per second, the printers will provide a speed of service approximately four times faster than conventional teletypewriter equipment now in use by the Armed Services.

Developed and built by SCM Kleinschmidt, a division of SCM Corp., the machines feature a 64-character type unit which can provide print lines of 72, 76, and 80 characters of standard or international communications symbols.

The high speed printing is achieved through a high velocity print hammer that produces copy originating from other terminals using punched paper tape precut and fed into a transmitting device. A single hammer module provides for printing up to 200 words per minute (w.p.m.) and printing rates of 400 w.p.m. when a double hammer is used.

AN/FGC-80 teletypewriter, capable of operating at speeds up to 400 words per minute, is demonstrated by Pfc Judith Orr of the U.S. Army Strategic Communications Command.

Kleinschmidt officials said a maximum use of electronic circuits to eliminate electro-mechanical functions makes possible the machines' high reliability and low maintenance. The printer requires only one-sixth of the moving parts used in standard teletypewriters.

A compact electronic module, located in the rear of the printer, supplies the logic for operating the printer. Individual circuit boards provide a simplified method of maintenance and permit maximum flexibility in adding optional operating features.

The printer is compatible with existing 60, 75, and 100 w.p.m. communications and speed changes are accomplished by electric switches.

USAEPG Weighs Advantages Claimed for PCM Systems

Pulse code modulation (PCM) is being tested as a replacement for present U.S. Army area and airborne mobile communications systems at the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz.

PCM equipment is being compared for performance with frequency division multiplex equipment now in use and evaluated for compatibility with present signal center facilities.

Several advantages claimed for PCM systems are that they are smaller, lighter, and cheaper. A 96-channel PCM terminal, for instance, weighs only 313 pounds while its present counterpart weighs 6,000 pounds. Engineers also estimate that PCM will reduce the unit cost per channel of military communications.

PCM offers additional technical advantages. It is less noisy over long distances. Where ordinary amplification results in building up both the weak signal as well as the noise accompanying it, regeneration—as used in PCM—recreates only the flow of coded pulses before they become too weak for further transmission. Finally, it is easy to operate and maintain.

Pulse modulation equipment will handle radio teletype as well as voice and can transmit coded data programed for a computer. Other than experimental circuits operated by commercial telephone companies, the Army's research and tests are considered pioneer efforts to develop PCM.

Scientific Calendar

Conference on Environment Sensitive Mechanical Behavior of Materials, sponsored by ARO-D, Martin Co., and American Institute of Mining, Metallurgical and Petroleum Engineers, Baltimore, Md., June 7-8.

Symposium on Automatic Support Systems for Advanced Maintainability, sponsored by IEEE, St. Louis, Mo., June 7-9.

1st Annual IEEE Communication Convention Including Globecom VII, sponsored by the University of Colorado and National Bureau of Standards, Boulder, Colo., June 7-9.

Joint Conference on Applied Mechanics and Fluids, sponsored by ASME, Washington, D.C., June 7-9.

Modern Mathematical Physics Symposium, sponsored by AFOSR, N.Y.C., June 7-9.

11th Annual Radar Symposium, sponsored by Electronics Command, AMC, Department of the Navy and Department of the Air Force, Fort Monmouth, N.J., June 7-11.

11th Conference of Army Mathematicians, sponsored by ARO-D, Philadelphia, Pa., June 9-10.

Materials Symposium, sponsored by AFSC, Miami, Fla., June 9-11.

Joint Conference on Metals Engineering and Production Engineering, sponsored by ASME, Berkeley, Calif., June 9-11.

19th National Organic Symposium, sponsored by the American Chemical Society, Tempe, Ariz., June 13-17.

16th Mid-America Symposium on Spectroscopy, Chicago, Ill., June 14-17.

Symposium on Molecular Structure and Spectroscopy, sponsored by Ohio State University, Columbus, Ohio, June 14-18.

Propulsion Joint Specialist Conference, sponsored by AIAA, Colorado Springs, Colo., June 14-18.

International Symposium on Multivariate Analysis, sponsored by Aerospace Research Labs, Dayton, Ohio, June 14-19.

10th Anniversary Air Force Office of Scientific Research Seminar (Science in the Sixties), Cloudcroft, N. Mex., June 14-25.

12th Annual Meeting of Society of Nuclear Medicine, Bal Harbour, Fla., June 17-19.

11th Annual Meeting of American Nuclear Society, Gatlinburg, Tenn., June 20-24.

Annual Meeting of American Medical Association, N.Y.C., June 20-24.

International Conference on Sintering and Related Phenomena (Emphasis on Nonmetallic Solids), sponsored by the University of Notre Dame, Notre Dame, Ind., June 21.

Aerospace Technical Conference and Exhibit, sponsored by IEEE and ASME, Houston, Tex., June 21-24.

Symposium for Biomedical Engineering, sponsored by IEEE and U.S. Naval Hospital, San Diego, Calif., June 21-25.

5th Berkeley Symposium on Mathematical Statistics and Probability, sponsored by ARO, AFOSR, ONR, NIH, NSF, and University of California, Berkeley, Calif., June 21-July 18.

6th Joint Automatic Control Conference, sponsored by IEEE, ASME, AICE, ISA, and Aircraft Industries of America, Troy, N.Y., June 22-25.

Symposium on Fluid Mechanics and Heat Transfer Under Low-Gravity Conditions, sponsored by AFOSR and Lockheed Missiles and Space Co., Sunnyvale, Calif., June 24-25.

Conference on Small-Angle -Ray Scattering, sponsored by ARO-D and Syracuse University Research Institute, Raquette Lake, N.Y., June 24-27.

Seminar on Relativity Theory and Astrophysics, sponsored by AFOSR, ONR, ARO-D, AEC, and NSF, Ithaca. N.Y., June 24-July 22.

Summer Power Meeting, sponsored by IEEE, Detroit, Mich., June 27-July 2.

Symposium of Physical Chemistry Division of the American Chemical Society Symposium, Buffalo. N.Y., June 28-30.

Relaxation Techniques in Chemical Kinetics, sponsored by AFOSR, ACS, and State University of New York, Buffalo, N.Y., June 28-30.

2nd Interdisciplinary Conference on Electromagnetic Scattering, sponsored by USAF and University of Massachusetts, Amherst, Mass., June 28-30.

National Symposium on Electromagnetic Comnatibility, N.Y.C., June 28-30.

Gordon Research Conference on Environmental Sciences and Engineering, New Hampton, N.H., June 28-July 2.

International Data Processing Conference, sponsored by Data Processing Management Association, Philadelphia, Pa., June 29-July 2.

Army Considers Logistic Backup Concept

Project Flat-Top, involving conversion of a Navy seaplane tender to a maintenance facility for operating helicopters, is being explored by the Army as a logistics backup concept for the soldier in the field.

The project was started in 1962 by the U.S. Army Materiel Command. The *U.S.S. Albemarle (AV-5)*, being modified at the Naval Shipyard in Charleston, S.C., is expected to be in operation by January 1966.

Mothballed from 1960 to 1963, the ex-Navy vessel is being equipped with a flight deck much like those found on an aircraft carrier. Once at sea, the converted tender will act as a repair and maintenance facility for Army helicopters on flying missions.

Last year, the U.S. Army Missile Command, Redstone Arsenal, Ala., was assigned the mission of developing a system for storage and retrieval of technical information on the helicopters for rapid dissemination to 32 repair shops located on five decks aboard the ship.

Even though the tender is 500 feet long, space aboard the ship is limited because of more than 1.2 million documents that must be stored in the technical data library. To conserve space, the documents (2,500 250-page manuals and 500,000 drawings) will be microfilmed. This job is to be completed by October 1965.

Once the information is stored in the library, closed-circuit TV, facsimile transmitters and receivers, and an intercom system will be used to relay the needed maintenance or repair information to the machine shops.

In addition to the shipboard communications system, the setup will allow radio facsimile transmission between the ship at sea and the Project Flat-Top Office, located at the Army Aeronautical Depot Maintenance Center, Corpus Christi, Tex.

The Department of Defense and International Standardization Office, Procurement and Production Directorate, has overall responsibility for development of the information storage and retrieval mission. Brown Engineering Co., Huntsville, Ala., has a $355,906 contract for services in setting up the technical data system for the project.

Another Project Flat-Top task in progress at the Army Missile Command is being carried out by the Supply and Maintenance Directorate in support of the XM-3 armament subsystem. The mission includes mounting of 2.75-inch rockets on UH-1B helicopters now flying missions overseas. Other armament systems managed for Redstone may be considered later for the project.

Flat-Top will be manned by Military Sea Transportation Service civilian personnel, who will perform all duties connected with running the ship. The helicopter maintenance work will be done by Army personnel of the First Aircraft Maintenance Battalion (Depot) (Seaborne).

Combat Service Support Activities Being Reorganized

A reorganization of active U.S. Army combat service support activities known as CO-STAR II (Combat Service to the Army), which began last month, is scheduled for completion in December.

Designed to improve the control and quality of supply, service, and maintenance support in the corps and field army area to the rear of divisions, CO-STAR II will be performed without disturbing current field army operations.

Supply, service, and maintenance support operations will be realigned along functional lines and placed under control of a single agency, the field army support command (FASCOM).

A FASCOM will consist of a headquarters, support brigades, and separate Army-wide brigades. The support brigades will provide supply and maintenance service except for munitions, medical and missile items. Separate brigades will provide Army-wide services for ammunition supply, medical, transportation, civil affairs, military police, replacement, and certain administrative functions. The command also will have responsibilities for security and damage control in the rear areas.

This system replaces current procedures in which supply and other support units are under the operational control of special staff sections in the field army headquarters. In the reorganization, the ordnance, quartermaster, chemical, transportation, provost marshal, and finance sections in the field army headquarters will be eliminated, permitting the field army commander and his staff to devote more time and attention to training and combat operations.

Seven new and two revised military occupational specialties (MOS) in the field of supply and maintenance will facilitate assignment of the best qualified officers in these newly created functionalized positions. This will increase career opportunities and provide greater incentive for technical service officers.

CO-STAR II is an extension of other recent changes in the Army structure designed to improve logistic management and support. The Technical Services were reorganized along functional lines in 1962 and the support activities within combat divisions were reorganized under a single support command.

3 ERDL Employees Present Technical Papers to ASCE

Three employees of the U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va., made technical presentations at the annual dinner meeting of the National Capital Section, American Society of Civil Engineers, Apr. 13.

Solomon Goldfein, chief, Plastics Research Branch, discussed "Plastic Reinforced Cement." John F. Sargent, marine engineer, Marine and Bridge Division, spoke on "Shallow-Draft Boats for Counterinsurgency." Paul E. DesRosiers, Jr., a chemical engineer in the Sanitary Sciences Division, spoke on "Emergency Water Supply from Exhaust Gases."

Col J. H. Kerkering, commanding officer of the Laboratories, welcomed the guests and introduced speakers.

FUTURE COMBAT 'COPTER, in the Project Definition Phase (PDP), was recently revealed by the Lockheed-California Co. The proposed Advanced Aerial Fire Support System (AAFSS) aircraft will carry a variety of weapons to provide the Army with the capability of escorting troop-carrying helicopters and associated fire support. Lockheed and Sikorsky Aircraft Division of United Aircraft Corp. were recently awarded contracts to perform the 6-month PDP which precedes full-scale development.

Kudos

Albert Wohlstetter, a consultant to the Department of Defense on international security affairs, received the Department of Defense Medal for Distinguished Public Service on Mar. 31 from Secretary of Defense Robert S. McNamara.

Wohlstetter has accepted appointment as professor of political science at the University of Chicago, and has been a consultant to the Assistant Secretary of Defense (International Security Affairs) since 1961.

Formerly he was a professor at the University of California at Berkeley and the University of California at Los Angeles and has served as a representative of or as an adviser to several Government organizations.

Wohlstetter's citation states that he "has contributed immeasurably to the defense of the United States." During the past 14 years, he led a series of research projects concerned principally with the deterrence of nuclear war and lessening the likelihood of war by miscalculation. Most of these studies were conducted at the RAND Corp., where he was employed from 1951 to 1963.

The citation further states that he "has made unique and valuable contributions to the conceptual framework of contemporary arms and arms control policy, to concepts affecting the design of weapons systems now in use, to the development of current modes of operation of U.S. strategic forces, and to the orientation and research method of systems analysis today."

Col Charles A. Henne, chief, Electronic and Instrumentation Section, U.S. Army Combat Developments Command Experimentation Center, Fort Ord, Calif., recently received the Legion of Merit.

Col Henne, an Armor officer with more than 25 years of active service, was cited for exceptionally meritorious service while serving as commanding officer, 3rd Armor Division Trains and then as chief of staff, 3rd Armored Division (Spearhead), U.S. Forces, Europe from August 1962 to June 1964.

Three elements of the U.S. Army Missile Command received Presidential Citations late in March for cost savings totaling approximately $32.5 million during the 1964 fiscal year. The Supply and Maintenance (S&M) Directorate saved $17.4 million; the Procurement and Production (P&P) Directorate chalked up savings of $13.9 million; and the Army Missile Support Command (AMSC) recorded savings of $1.1 million. Maj Gen John G. Zierdt, commanding general of the Missile Command, presented the Citations to Col Thomas W. Cooke, AMSC commander; Col B. A. Saholsky, P&P Director; and A. A. Stewart, S&M deputy director.

Capt Arthur S. Leon, Department of Cardiorespiratory Diseases, Division of Medicine, Walter Reed Army Institute of Research, Washington, D.C., recently was awarded the Army Commendation Medal for outstanding and meritorious service as chief, General Medical Section, 34th General Hospital, La Chapelle-Saint Mesmin, France from Oct. 10, 1961 to Sept. 27, 1964.

The citation singled out his vast knowledge of cardiology, biochemistry and internal medicine, development and administration of the French intern training program, also, prolific writing of medical articles and oral presentations at the annual convention of the American Medical Association and other meetings which enhanced the stature of Army medicine in Europe.

Lt Col Oscar Felsenfeld, U.S. Army Medical Corps pathologist and international expert on tropical diseases, retired from active service Apr. 1 to join the staff of Tulane University Research Center.

He was research pathologist, Department of Experimental Pathology, Walter Reed Army Institute of Research since September 1962. His resignation climaxes over 12 years of military service which, on four occasions, brought him official recognition for outstanding performance of duty.

For three years he combatted infectious diseases in Thailand as executive director of the Southeast Asia Medical Research Laboratory in Bangkok. A native of Czechoslovakia who came to the United States in 1940,

MICOM Scientist Named for MIT Sloan Fellowship

William V. Gudaitis, U.S. Army Missile Command scientist, has been selected for an Alfred P. Sloan Fellowship at the Massachusetts Institute of Technology (MIT).

The deputy director of the Army Inertial Guidance and Control Laboratory, Directorate of R&D at Redstone Arsenal, Ala., will join about 45 other Sloan Fellows, representing a wide variety of industries, when classes begin in June.

Designed for promising young executives, the Fellowship is an intensive 9-month program of study in which major emphasis is given to the acquisition of new knowledge in business and to essential skills and managerial techniques required of top-level busness executives.

A native of Pittston, Pa., Gudaitis joined the Army Ballistic Missile Agency in 1960 as deputy director of the Guidance, Control and Aeroballistics Laboratory. At that time, reorganization of research and development was underway after the departure of Dr. Werhner von Braun and his Development Operations Division to the National Aeronautics and Space Administration.

William V. Gudaitis

Prior to coming with the Army, Gudaitis worked for more than seven years in the development of the Redstone and Jupiter ballistic missile systems as head of the Control Design Department for Chrysler Corp.

Gudaitis received a B.S. degree in physics from the University of Detroit and has done graduate work at Harvard University and Massachusetts Institute of Technology.

At MIT, the Sloan Fellows will study a variety of subjects, including economics, labor relations, law, foreign policy, finance and taxation. The group will meet with top officials in industry and Government.

Gudaitis is a member of the American Institute of Aeronautics and Astronautics, the Institute of Electrical and Electronic Engineers and their professional group on electronic computers, the American Ordnance Association, and the AUSA.

He has an M.D. degree, an M.S. degree in chemistry and anthropology, and diplomas in public health and tropical medicine. He holds the Army Commendation Medal with two Oak Leaf Clusters.

Col Howie Named Medical R&D Command Deputy CO

Col Donald L. Howie, a specialist in blood and blood-forming tissues, was assigned recently as deputy commander of the U.S. Army Medical R&D Command. He will also continue to serve as chief of the Plans, Programs and Funds Division.

The colonel joined the Command in March 1962 as assistant chief of the Medical Research Branch. In July 1963, he was assigned to the Program Planning Office which later became the Plans, Programs and Funds Division. He was assistant chief of the Department of Hematology and deputy director of the Division of Medicine at Walter Reed Army Institute of Research, 1960-62.

A native of Monticello, Iowa, Col Howie completed premedical training at the State University of Iowa before serving in the Army from 1943-46. In 1948, he received an M.D. degree from the University of Iowa School of Medicine.

Completing his internship training at Denver General Hospital in 1949, he reentered the Army as a regimental surgeon with the 7th Infantry Division in Hokkaido, Japan. Other assignments in the Far East Command took him to Korea with the 1st Cavalry Division, and later back to Japan with the 31st Station Hospital.

Upon returning to the U.S. in 1952, the colonel was in residency training at Brooke General Hospital, Fort Sam Houston, Tex. Since 1954, his important tours of duty include WRAIR, Washington, D.C.; Fort Riley, Kans.; Queen Alexandria British Military Hospital in London; and as European Consultant in Hematology, Landstuhl, Germany.

Col Howie is a Diplomate of the National Board of Medical Examiners and the American Board of Internal Medicine. He is also a Fellow of the Royal Society of Medicine, London, and a member of the American Medical Association and the American College of Physicians.

He has written numerous scientific publications in the fields of hematology, blood and neoplastic diseases.

2 E-Command Executives Trade Jobs for 6 Months in Training Program

Two executive-level employees of the U.S. Army Electronics Command have traded jobs for six months in a program designed to broaden the knowledge of persons engaged in separate but closely interrelated positions at Fort Monmouth, N.J.

Inaugurated by Maj Gen Frank W. Moorman, CG, of the Electronics Command, the "cross-fertilization" plan is the outgrowth of an idea that the Command's different operating areas can serve as advanced schools of practical education for senior personnel who in effect become both on-the-job student and instructor.

The first step of the job swaps has been made by Arthur F. Daniel, director of the Power Sources Division, and Abraham E. Cohen, director of the Test Equipment and Power Sources Commodity Management Office.

Under terms of the program, Daniel has in actuality become the technical director of the Commodity Office, and Cohen the director of the Power Sources Division. They will return to their original organizations at the end of six months.

As Maj Gen Moorman points out, similar exchange programs are carried out between universities and within some industrial firms.

"What we are doing here," he said, "is to adapt the general idea to the particular structure of the Electronics Command, which has the mission of providing the Army with its electronic materiel. The exchange in positions will be carried out on a selective basis for specified periods, with no temporary sacrifice in efficiency, but with the expectation of a good return in long-run benefits."

At the Laboratories, Daniel has engaged in the research and development phases of providing electrical energy sources for field equipment. Through being focused on research and development, the function of the Laboratories is thereby viewed as a highly "intense," or concentrated, type of operation.

On the other hand, the Command's seven Commodity Management Offices have managerial responsibilities that bridge the entire life-cycle of logically grouped items and equipment.

Thus in the Test Equipment and Power Sources Commodity Management Office, the responsibility in electrical energy devices encompasses but goes beyond the Laboratories' part of the job. This is also true of the test devices that cover the broad field of electronic equipment.

In its successive phases, the life-cycle form of management extends from determination of the Army's requirements for new or improved equipment, through the research, development, and testing of new models, through large-scale production, delivery to troops in the field, responsibility for proper operation and maintenance, disposal when useful life is ended, and replacement by a new generation of equipment.

Along with being well seasoned in electronic technology and program administration, both Daniel and Cohen hold advanced university degrees.

Daniel has been with the Laboratories 23 years and has headed the Power Sources Division since 1956. He holds bachelor's and master's degrees in chemistry from the University of North Carolina, and has done further graduate work in physics at the University of Chicago and in electrical engineering at Harvard University.

Cohen has worked at Fort Monmouth over 16 years, and has held several major technical and executive positions. He has been engaged in the electronic commodity management field for the past two years, and became technical director of the Test Equipment and Power Sources Commodity Management Office a year ago.

He holds a B.S. degree in electrical engineering from City College of New York, an M.S. in E.E. from Rutgers University, and has done further work toward a Ph. D. degree.

Arthur F. Daniel

Abraham E. Cohen

When the Army Research and Development Newsmagazine *was in its infancy, in the March 1961 edition, a "Letters to the Editor" column was introduced. Contributions did not permit continuance of this feature, but now that the irreplaceable talent of Dr. R. G. H. Siu's wise and witty T-Thoughts column has been lost (not permanently, we fervently hope), the letters-to-the-editor idea is being revised as a perhaps milder "cup of tea." Contributions on pertinent matters.*

* * *

Dear Editor:

You and I have worked together often enough to know that neither of us tries to brow-beat the other with technical jargon. We are accustomed through long usage to saying to each other, "Just what does this mean in simple English that the layman can understand?"

An article on page 3 of the March 1965 issue (Vol. 6, No. 3) of your excellent monthly Newsmagazine demonstrates clearly that the work of simplification is really quite complex: it is not simple to simplify.

In the article in question, your author was treating a certain Laser whose light beam has a wave length of 6,328 Angstroms. To simplify matters for the layman's understanding, he adds parenthetically that "An Angstrom unit . . . equals about one 250 millionths of an inch."

If the diligent layman multiples this out, he will reach the remarkable conclusion that the wave length of the Laser beam here described is of the order of over 1½ inches (6,328 times 1/250 million = 1,582 million); which, as light wave lengths go, is very long indeed and more properly characterized as a shrille audible tone!

Dr. Robert Watson [chief, Physics and Engineering Branch, U.S. Army Research Office] tells me that your author really meant than an Angstrom unit equals about one 250 millionths *of a millionth* of an inch, which reduces my 1½ inch estimate to about 1½ millionths of an inch. Such a difference is not large, of course, if it is added to the distance from here to Chicago. It is a substantial amount, however, if we add it to the length of a layman s nose.

Moral: Simplicity without precision is chaos.

Yours for simplicity,

LYNN E. BAKER
U.S. Army Chief Psychologist
Human Factors and Operations
Research Division

Army Awards $75 Million in Contracts

General Motors Corp. received the largest aggregation of the $75.8 million in U.S. Army contracts for research, development, testing, and production issued in recent weeks.

The three contracts to General Motors included $20,656,173 as the first increment of a 4-year buy of M109 Medium Self-Propelled 155 mm. Howitzers and XM551 Armored Reconnaissance/Airborne Assault Vehicles; $3,440,100 for design and development of the new main battle tank; and $1,389,180 for TX-100-1 transmissions for use in various vehicles.

Raytheon Co., Lexington, Mass., was issued an $8,907,548 modification for design and development of the Hawk missile system. Kaiser-Jeep Corp., Toledo, Ohio, received two contracts totaling $6,803,193 for 209 5-ton trucks and 417 2½-ton trucks.

Hughes Tool Co., Aircraft Division, Culver City, Calif., was awarded a $5,560,046 modification to an existing contract for primary helicopter trainers with installed engines. Chamberlain Corp., Scranton Army Ammunition Plant, Scranton, Pa., received a $3,516,775 contract for 155 mm. projectiles.

Buxmont Ordnance Co., subsidiary of J. W. Rex Co., Lansdale, Pa., received a $2,862,873 agreement for ordnance items. Stevens Manufacturing Co., Ebensburg, Pa., was awarded a modification for production of ¼-ton, 2-wheel cargo trailers and a new contract for 5,220 additional ¼-ton cargo trailers. Total of both was $2,835,865.

Admiral Corp., Chicago, Ill., received $2,589,222 as the first increment of a 3-year buy of radio sets. Remington Arms Co., Inc., Bridgeport, Conn., was awarded a $2,362,512 agreement for 5.56 mm. cartridges. Philco Corp., Aeronautics Division, Newport Beach, Calif., was issued a $2,272,328 modification to an existing contract for Sillelagh industrial engineering services.

Martin-Marietta Corp., Orlando, Fla., received a $1,957,000 increment to an existing contract for Improved Program Test Station research and development, engineering and production prototypes for the Pershing weapons system.

Firestone Tire and Rubber Co., Akron, Ohio, received a $1,820,012 modification for shoe assemblies for M48 and M60 tanks. Amron Corp., Waukesha, Wis., was issued a $1,478,474 agreement for cartridge cases for the 20 mm. gun for the Air Force.

Batesville Manufacturing Co., Batesville, Ark., was awarded a $1,395,825 contract for ammunition components. Motorola, Inc., Scottsdale, Ariz., won a $1,394,720 letter contract for 26 Radar Data Transmitting Sets; 26 Test Fabrication Kits, 16 Radar Data Receiving Sets and ancillary items.

Thiokol Chemical Corp., Bristol, Pa., was issued a $1,269,453 modification for loading, assembling, and packing of signal equipment. United Aircraft Corp., Hamilton Standard Division, Broad Brook, Conn., was awarded a $1,178,068 contract for 65 manually operated field telephone switchboards.

U.S. Rubber Co., New York City, gained a $1,086,217 modification for layaway maintenance and support services at the Joliet Ammunition Plant, Joliet, Ill. REDM Corp., Wayne, N.J., received a $1,026,853 contract for head assemblies for mortar fuzes.

Col Nolan Assigned to KMAG As Senior Logistics Adviser

Col Hubert L. Nolan, deputy chief of the Physical Sciences Division, U.S. Army Research Office, departed in May for an assignment with the Korean Military Advisory Group (KMAG), Seoul, Korea, as senior logistics adviser to the chief, KMAG.

Col Nolan served nearly three years as deputy chief of the Physical Sciences Division. Previously he was deputy, then chief of the Plans and Operations Division, U.S. Army Combat Surveillance Agency, Arlington, Va., from 1959-62.

During World War II, Col Nolan served in the China-Burma-India theater. He holds a B.S. degree from the Georgia Institute of Technology, and M.S. in mechanical engineering from Purdue University, and is a graduate of the Command and General Staff College.

E-Command Board Decides Merit of Inventions

More than 5,000 inventions have been judged in the past 16 years by a group of U.S. Army Electronics Command (Fort Monmouth, N.J.) scientists, engneers, and patent attorneys.

Responsible for protecting the rights and promoting the interests of inventors, the U.S. Army Electronics Invention Evaluation Board has met more than 200 times to consider and pass on the possible value of inventions made within the Electronics Command, its predecessor organizations, and Command contractors.

Scientific and engineering members of the board are drawn from the U.S. Army Electronics Laboratories, a major directorate of the Command and the most prolific source of patentable inventions. The attorneys come from the Electronics Command Patent Agency.

Current members of the board from the Laboratories are C. A. Zelaites, chairman, Moe Abramson, I. O. Myers, A. H. Ross. Legal advisers from the Patent Agency include J. C. Keppler and B. L. Prouty.

More than half of the 5,000 invention disclosures considered by the Board have been recommended for patent action. Often faced with disclosures beyond the immediate experience of its members, the Board calls upon the many experts in specialized fields in the Laboratories for assistance in evaluation.

Invention disclosures considered have ranged from comparatively simple single items, such as tube or transistor improvements, through multiple component devices, to complex systems such as the random access discrete address concept of communications.

When a patent is issued, the prestige of the inventor is enhanced in the scientific and engineering community, and normally the assignment of rights is made to the Government.

Benefit to the public comes through licensing agreements that can be obtained by responsible commercial and industrial concerns.

Former USARO Executive Managing Night Vision Work

Col John E. Schremp, newly assigned manager for night vision at the U.S. Army Engineer R&D Laboratories (USAERDL), Fort Belvoir, Va., is the 33rd project manager within the U.S. Army Materiel Command.

The project manager concept is applied to the Army's largest and most important projects. It gives the manager full authority and responsibility for all phases of a program, from research to logistical support on the battlefield. Lt Col Frederick C. Badger is deputy project manager for the night vision program.

The location of the Night Vision Project Manager's Office will place it in close proximity to the R&D efforts carried out by the Laboratories' Warfare Vision Division; also, to the engineering for procurement performed in their Electrical Engineering Division.

Night vision equipment includes components, viewing systems, and battlefield illumination methods for such military applications as weapon sighting, observation, vehicle movement, and aircraft operation.

Col Schremp, the first executive officer for the U.S. Army Research Office, Office of the Chief of Research and Development, was named project manager following a tour in Thailand as commanding officer of the 9th Logistical Command. Previous overseas assignments included service in Saipan, Okinawa, Taiwan, and Europe.

A 1941 graduate of the U.S. Military Academy, he earned a master's degree in civil engineering from Massachusetts Institute of Technology in 1948. He completed the Engineer Advanced Course at Fort Belvoir (1949), studies at the Command and General Staff College, Fort Leavenworth, Kans. (1953), and at the Army War College (1962).

LT COL BADGER was assigned to the Laboratories from Saigon, Vietnam, where he had served the past year with MAAG (Military Advisory Assistance Group). He previously served with the Army of Occupation, Japan; the Pittsburgh, Pa., District, Corps of Engineers; Fort Leonard Wood; as an instructor at the U.S. Military Academy; 25th Infantry Division, Hawaii; Continental Army Command and the Test and Evaluation Command.

He attended Virginia Polytechnic Institute, but transferred to the U.S. Military Academy, where he received his degree and commission in 1946. He received a master's from California Institute of Technology (1950); completed the Engineer Officers Basic Course (1947), the Advanced Course (1953), and attended the Command and General Staff College (1962).

Col John E. Schremp

Army to Display MUST At Paris Air, Space Show

Wider public exposure of the Army's new field medical care concept MUST (Medical Unit Self-Contained, Transportable) is planned through demonstrations in Paris, France.

Considered a vast improvement over present field hospital facilities, the MUST will be displayed as one of the official United States Government exhibits at the 1965 Paris Air and Space Salon at LeBourget Airport, June 11-21.

U.S. participation in this year's air show, which is being coordinated by the U.S. Departments of State, Defense, and Commerce, will focus on American advances in aerospace technology. It will combine static aircraft and space displays with flying demonstrations.

The U.S. Department of Defense will display some 40 aircraft and missile exhibits and hold 19 flight demonstrations on the two days set aside for military aerial exhibitions. In addition, more than 35 private U.S. industries will be exhibitors at the fair.

U.S. Army aircraft and helicopters to be exhibited include the Beech U-8F Seminole, Grumman OV-1B Mohawk, Bell UH-1B and UH-1D Iroquois and UH-13H Sioux, Boeing CH-47A Chinook, and Lockheed XH-51A Workhorse.

Both the Blue Angels demonstration team of the U.S. Navy and the Thunderbird team of the U.S. Air Force will present aerial demonstrations on Sunday, June 20, as a part of their Europe-wide tours.

Army Awards MTE Contract

The Army Missile Command at Redstone Arsenal, Ala. has awarded a $1,250,000 contract to Radio Corp of America as part of its Multi-system Test Equipment Program to find a single test and repair system able to service several future land combat missile systems.

Task LEAD Develops Infantry Platoon Leadership Training

Research over the past two years on how to teach Infantry rifle platoon leaders, in noncombat training situations, what they should know and do to lead units successfully in combat is believed nearing the payoff phase.

Task LEAD is an Army study conducted under contract by the Human Resources Research Office of the George Washington University. HumRRO project leaders reported recently present indications are that results of the study will have immediate and long-range payoff.

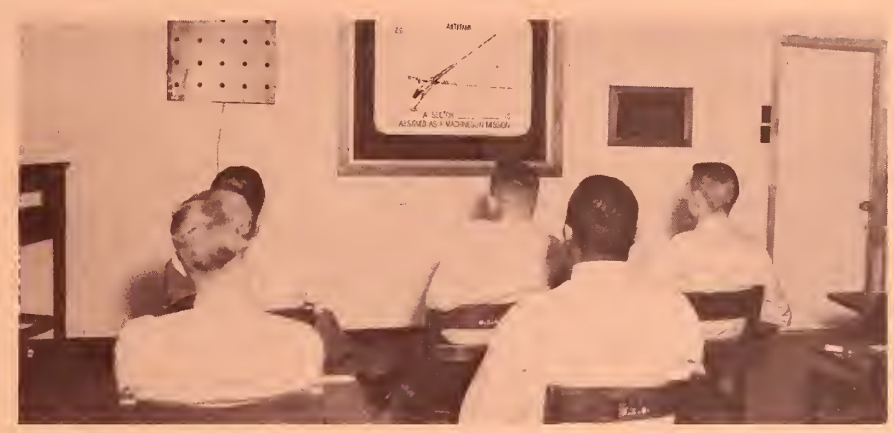
HumRRO Division No. 4 is conducting the study at the U.S. Army Infantry School, Fort Benning, Ga., under the direction of HumRRO Headquarters in Alexandria, Va. The first phase is designed to identify the critical knowledge and skills that contribute to individual and unit effectiveness in battle.

The second subtask has the objective of devising prototype training methods that will reduce the training time and the need for actual terrain in teaching the knowledge and skills identified as critical in LEAD I.

Two major sources of information are being used in the first subtask —observations of platoon leaders' behavior in Army Training Tests (ATT) and analysis of a large number of small unit battlefield actions from World War II to the present.

HumRRO scientists consider the ATT as the best means of providing peacetime behavioral measures of leadership with some degree of combat realism.

Data being utilized include performance observations of junior officers leading their platoons in battalion-level ATT in this country and abroad. These data have been tabulated as frequency counts of platoon leader activities—essentially a task analysis.



JUNIOR OFFICERS study a projected frame in Task LEAD programed instruction at the United States Army Infantry School, Fort Benning, Ga.

The research staff also is collecting some 225 accounts of small unit engagements under a wide variety of combat conditions. Accounts are being analyzed systematically to obtain two categories of information: dimensionalization of combat situations and analysis of leader actions.

Dimensionalization is expected to produce knowledge of the variables that affect the outcome of combat situations. This knowledge can improve combat leadership training if the leader is taught to anticipate the kinds of situations he is likely to encounter, and the variables important in these situations.

Analysis of leader actions seeks to identify the critical combat knowledge and skills required of the platoon leader, and is expected to enable the HumRRO scientists to sort them into a smaller number of learning classes.

This latter point is considered important because a great deal is already known about how various kinds of knowledge and skills can best be taught.

When LEAD I is completed, HumRRO will provide the Army with several important products, including a set of student performance objectives for training the Infantry rifle platoon leader that may be used in development of instruction for Basic Infantry Officers. These objectives, which will be based on analysis of critical combat skills and knowledges, will be specified in behavioral items.

Another expected product of LEAD I is a volume containing the entire collection of accounts of small-unit combat actions, together with their analyses, for use by instructors at the Infantry School and elsewhere.

A similar volume for student use will contain selected combat actions best illustrating the knowledge, skills, and experiences important to an Infantry rifle platoon leader.

The first effort of the LEAD II subtask, relating to terrain simulation for training, was an investigation of programmed instruction as a vehicle for teaching the fundamentals of defensive tactics at the Infantry School.

Relying on current field manuals and other sources, a linear self-paced program was developed in booklet form and tested on 120 junior officers newly assigned to the Infantry Officer's Basic Course.

The conclusion drawn for this study was that it is feasible to present the fundamentals of tactics in programed instruction format, with a substantial saving in time and no penalty in terms of the amount retained on an immediate test. Additional work is being done to explore programed instruction in practical exercises.

EXPERIMENTAL DEVICE developed as a result of exploratory efforts at terrain simulation undertaken by HumRRO in Task LEAD is observed by Dr. T. Owen Jacobs, Division 4 director of Research, and M/Sgt David Sellers.

Willie G. Putnam

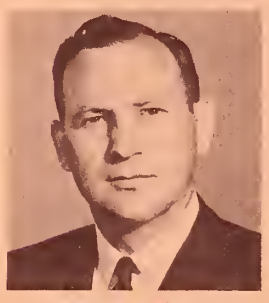
Donald Hubbard

James Dennis

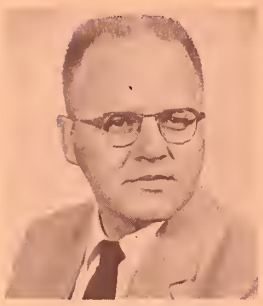
S. I. Hetrick, Jr.

Richard A. Green

Clair Weiss



Richard Gainey



Horace Leathers

Vincent Bagdon

James Thrower

Edward Gillis

Frederick Carlson

Donald Dinger

13 Engineers Nominated for ERDL CO's Medals

(Continued from page 1)

Candidates for the Scientific Achievement Medal are Frederick F. Carlson and Donald B. Dinger. Carlson is a research physicist in the Basic Research Laboratory. Dinger is an engineer in the Electrical Power Division.

Nominated by the Military Department for his study of paramagnetic resonance of nitrogen atoms trapped in X-irradiated alkali azides, Carlson is credited with providing a better understanding of the mechanism of decomposition of metastable compounds—and, thus, of the initiation mechanism of certain types of explosives.

The Electrical Department nominated Dinger for investigations of the effects of a nuclear detonation electromagnetic pulse on field Army electrical power generation, transmission, and distribution systems.

Dinger is recognized for developing an analytical technique which permits extrapolation of nuclear electromagnetic test data from the distance at which it was measured to other values of horizontal range, and determination of the other nuclear electromagnetic pulse field components from a measured component.

Technological Achievement Medal nominees and their nominating agencies include Richard J. Gainey, Military Department; Clair G. Weiss, Office of the Comptroller/Director of Programs; Horace Leathers, Mechanical Department; James J. Thrower, Engineering Department; Vincent J. Bagdon, Technical Services, and Edward A. Gillis, Electrical Dept.

Gainey, a supervisory engineer in the Sanitary Sciences Division, was nominated for his work on the concept, development, design, test, and type classification of the aluminum distillation equipment.

Weiss, a mechanical engineer in the Technical Operations Division, was recognized for his work in preparing and reviewing many technical plans, contracts, and other projected documents such as program data sheets, restructuring documents, project cards, and technical development plans.

Leathers, a mechanical engineer in the Mechanical Equipment Division, was selected for guiding development of the Universal Engineer Tractor.

An electronics engineer in the Electrical Engineering Division, Thrower was nominated for his work in management of that portion of the night-vision equipment program involving the transition from the R&D phase to the present procurement phase.

Bagdon is a mycologist in the Materials Research Laboratory. He was chosen for his work on Project BEARS (Bacteriological Effects, Aircraft Refueling Systems). This required establishing the microbiological criteria essential to obtaining meaningful test data.

Gillis is a mechanical engineer in the Electrical Power Division. The basis for his choice is the engineering design and development of greatly improved hydrazine-air fuel cell electrodes and cell stacks. His work has permitted development of fuel cell's critical silent power applications.

Leadership Medal nominees are James A. Dennis, Military Department; Samuel I. Hetrick, Jr., Office of the Comptroller/Director of Programs; Donald G. Hubbard, Mechanical Department; William G. Putnam, Engineering Department, and Richard A. Green, Technical Services Dept.

Dennis is an engineering technician in the Combat Engineering Division, Hetrick heads the Budget and Programs Division, and Hubbard is chief of the Power Plant Laboratory, Engine Division. Putnam is chief of the Inspection Engineering Branch, Production Engineering Division, and Green is chief of the Motion Picture Branch, Pictorial Sciences Div.